Gas Journal

VOL. 300 111th YEAR LONDON, OCTOBER 21, 1959 No. 5016 PRICE 1/6

THE UNIVERSITY OF MICHIGAN
NOV 13 1959
ENGINEERING LIBRARY

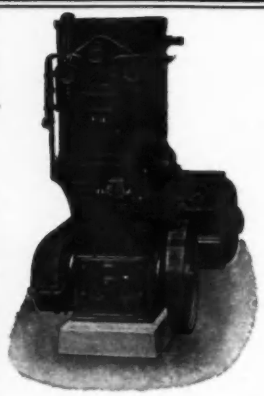
PRODUCT OF Radiation Ltd

GEORGE GLOVER & CO. LTD.

GAS METERS

maintain their lead in Design and Quality

GEORGE GLOVER & CO. LTD., RANELAGH WORKS, 122 KINGS ROAD, CHELSEA, LONDON, S.W.3

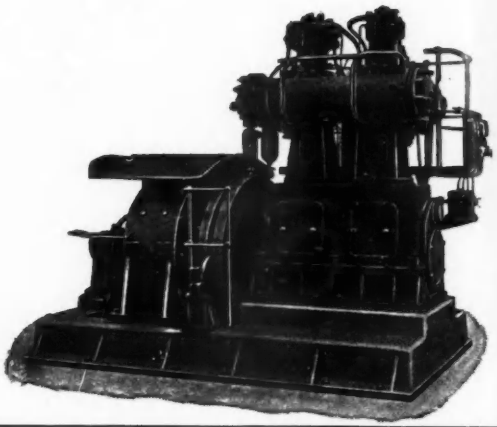


HIGH PRESSURE GAS COMPRESSORS *for*

pressures up to 5,000 lbs. per sq. in.

The illustrations show two high pressure gas compressors. As specialists in the design and manufacture of compressors for both air and gases, we make compressors for a wide range of capacity and pressure up to 5,000 lbs. per sq. inch.

The compressor shown above has a capacity of 25 cu. ft. of free hydrogen per minute compressed to 3,000 lbs./sq. inch. The illustration on the right shows a four-stage compressor with a delivered capacity of 200 cu. ft. of free town's gas per minute compressed to 5,000 lbs. per sq. inch.



For full information regarding gas compressors, write, giving particulars of the duty required, to—

REAVELL & CO., LTD.

RANELAGH WORKS, IPSWICH

Telegrams: "REAVELL, IPSWICH." Phone No. IPSWICH 56124 (3 lines)

the MARK II "CL"

High Pressure Valve

- *CORROSION RESISTING STEEL DOOR*
- *P.T.F.E. 'FLUON' SEATING RINGS*
- *SIMPLE AND ROBUST IN CONSTRUCTION*
- *POSITIVE IN OPERATION*
- *NO WEDGES OR SPRINGS*
- *SPINDLE STUFFING BOX FITTED WITH CHEVRON PACKING*
- *STANDARD TEST PRESSURE 100 p.s.i.g*
- *RAISED FACE FLANGES SUPPLIED BLANK OR DRILLED TO B.S.10 TABLES 'A' TO 'E' INCLUSIVE*
- *INTERNAL SCREW WITH OR WITHOUT INDICATOR*

SIZES 2" TO 24" BORE

VERTICAL OR HORIZONTAL

THE BRYAN DONKIN COMPANY LTD.

CHESTERFIELD TEL: 3153 · LONDON TEL: ABBEY 1096

There is nothing to equal

LEAD

Always use lead gas pipe to BS.602

THE LEAD SHEET AND PIPE
TECHNICAL INFORMATION BUREAU
is always glad to give advice
on the use of Lead Gas Pipe.

LEAD DEVELOPMENT ASSOCIATION
18, ADAM STREET, LONDON, W.C.2.
Telegrams: Leadevep, Rand, London. *Telephone:* WHitehall 4175

B.6

SPECIALISTS IN
SYPHON POTS
SURFACE BOXES
MANHOLE COVERS
FIREBARS, Etc.
VALVE and PIPE SPECIALS
ALL **GASWORKS CASTINGS**

BERRY'S FOUNDRY (1949) LTD
HAMMERTON STREET, BRADFORD, 3
Telephone: BRADFORD 27701

UNDERPRESSURE ENGINEERING CO. LTD.
UNION FOUNDRY, MANSFIELD, NOTTS.
Phone: Mansfield 1256/7, *Grams: Castings, Mansfield.*

DAMPER PLATE CONNECTIONS
GAS BRANCH CONNECTIONS
SPLIT GAS TEES WITH BAGGING OFF HOLE
LEADLESS SPLIT COLLARS
STOP COCK AND SURFACE BOXES
CENTRAL ACTION DRILL STANDS
DISTRIBUTION TOOLS, ETC.

London Office:
STAFFORD HOUSE · NORFOLK STREET · STRAND, W.C.2.
Phone: TEMple Bar 9910. *Grams: Washer Estrand, London.*

Gas Journal

VOL. 300 *No. 5016* *October 21, 1959*

111TH YEAR

MANAGING DIRECTOR: Clifford A. King

EDITOR: Geoffrey W. Battison

ASSISTANT EDITOR: Colin J. Godbold

TECHNICAL EDITOR: Charles J. P. de Winton, T.D., M.A., M.Inst. Gas E., M.Inst. F.

Published by Walter King Limited,

11, Bolt Court, Fleet St., London, E.C.4

Telephone: FLEet Street 2236-7 **Telegrams:- Gasking, Fleet.**

CONTENTS

EDITORIAL COMMENT

Must Gas Be Tied to Coal? - - - - - - - 143
Dead Heat? - - - - - - - - - - 144
No Smoking - - - - - - - - - - 144

SPECIAL ARTICLES

Tower Purifiers at Beckton - - - - - - - - 148
Nationalisation for a Decade. By R. Kelf-Cohen - - 150
The 'Empiric With Not a Particle of Science' Who Pioneered G.L.C. 150 Years Ago. By M. Schofield - - - 154

NEWS OF CURRENT EVENTS

Personal - - - - - - - - - - - 145
Correspondence: Interconnecting Mains, J. A. Gould - - 145
Diary - - - - - - - - - - - 145
Coleraine Makes Record Profit - - - - - - - 146
Choice of Fuel in Co. Durham - - - - - - - 146
Gas Exhibit at Clean Air Show - - - - - - - 146
Coloured Street Lighting 'A Sin' - - - - - - 146
Successor to Fare Play - - - - - - - - 147
Home Safety Plan Starts in Canada - - - - - - 146
Scottish Dealers' 'Threat to Employment' - - - - 147
Another Electricity v. Gas Row in Scotland - - - - 147
Television and the W.M.G.B. - - - - - - - 147
Book Review - - - - - - - - - - 152
Trade News - - - - - - - - - - 165

TECHNICAL RECORD

Coal: A Colloid and a Chemical. By Sir Eric Rideal - - 153
Linking the Earlston Undertaking with Galashiels Distribution System by Moleplough. By D. R. Adams - - - 158

PUBLISHERS' NOTICE SEE PAGE 168

PHOTO: HOUSTON ROGERS

Nadia Nerina, prima ballerina of the Royal Ballet, Giselle, Act 2.

the study of movement

As the graceful and expressive movements of the Ballerina are the culmination of years of diligent striving for perfection, so have the faultless movements of T.G. meters been developed by constant research and painstaking insistence upon only the highest standards of manufacture and design. And now, with the wealth of accumulated experience that comes of having supplied the British Gas Industry since 1844 with meters to suit all requirements, Thomas Glover & Co. offer a service that is second to none.

THOMAS GLOVER & CO. LTD., GOTHIC WORKS, ANGEL ROAD, EDMONTON, N.18 AND BRANCHES

TG.47

Gas Journal

VOLUME 300 No. 5016 OCTOBER 21, 1959 111th YEAR

Must Gas be Tied to Coal?

THE publication of the Gas Council's Annual Report for the year ending March 31, 1959, has made many outside the gas industry realise some of the difficulties the area boards are facing because of the rise in price of the industry's basic raw material. Perhaps the reaction to this in some quarters would not have been quite so pronounced if the Gas Council had not made a loss equal to about half its surplus of last year and the industry's first loss since nationalisation. But loss it is, and as things stand at the moment, it seems as if the position is unlikely to be bettered this year or next. The raising of gas prices, though it may cover the losses, is unlikely to encourage new business.

Costs must be cut and savings passed on the consumer. How is this to be done? More efficiency and greater productivity? Undoubtedly these are the lines on which the industry has been working these last ten years and has been quite remarkably successful. It has continued to close down inefficient works and concentrate on big plants equipped with all available mechanical handling devices; grid systems have been introduced, and administration and accounting have been centralised and rationalised.

There comes a limit, however, beyond which such methods cannot be used to reduce costs, especially when the price of the chief raw material, coal, moves against the industry, freights rise and the demand for coke falls. The solution is clearly to find some other suitable raw material, cut out freights altogether and dispense with a solid residue, the sale of which influences the price of gas. Oil gasification plants situated near the refineries and complete gasification plants at the collieries are an obvious solution; the necessary national grid being an integral part of the whole scheme.

The gas industry, as is well known, has increased its use of oil and refinery gases in the last few years and has shown that the importation of liquefied natural gas is an economic undertaking, though the amount imported in a 20,000-ton tanker is only equivalent to gas from about 2 mill. tons of coal. How is any extension of these experiments going to affect the coal industry? From the reaction of many in that industry to the news that liquid methane had arrived in the Thames, it is fairly certain that they envisage the demand for coal falling off sharply. Imports of oil have had a big effect on the sales of coal for industrial, commercial and domestic heating, and they have also caused a reaction in the sales of coke causing stocks to increase sharply during the last two years.

Ought the gas industry to feel bound to help the coal industry by using more coal and refrain from using other means of gas making in the national good? Clearly this is a political problem every bit as much as an economic one, but the nationalised industries are charged by their particular Acts of Parliament to at least break even over the years, taking one year with another. Why should the Gas Council consider stifling initiative merely to help another industry which, until recently has virtually had the monopoly of fuel and energy supply throughout the country? The coal industry should begin by getting away from this monopolistic outlook and the National Coal Board should realise that it should be run on more commercial lines. How long can the N.C.B. continue to hold such heavy stocks—some 32 mill. tons at the collieries 'out to grass'? Prices should be reduced to clear these stocks and production adjusted to suit. Plans for reduction in output are indeed being put into effect and the N.C.B. hopes that stocks may begin to move during the winter, but it is difficult to say whether any really aggressive sales campaign has been set in motion or if a reduction in prices is contemplated. Clearly the effects of the difficulties in the coal industry on the mining communities are going to be severe, but the numbers employed are being reduced by natural wastage; this is especially effective since the average age of those employed is high.

But this uncomfortable process which the coal industry is now having to resort to, has been going on—on a greatly reduced scale of course—in the gas industry ever since nationalisation. Because of it, the industry has been able to hold its own, although there has been little or no significant increase in gas output, in competition with electricity and oil, especially in the industrial field.

Both gas and coal have to compete with oil for the space heating load, whether in the factory or the home, but we feel that such competition will be more damaging

to coal than to gas. Fortunately for gas, all the operating advantages—except possibly the portability of the small heater—claimed by the oil industry for oil-fired space heating systems are even more applicable to the gas industry. Whole house heating by convected air systems or small bore central heating in the domestic field are far better done by gas than oil or solid fuels. We are in fact tempted to suggest that the oil industry could not do better than to encourage the gasification of oil on a really big scale to ensure that its products were being used economically. In this way the gas and oil industries would draw even closer together and away from coal.

It must be remembered that it is not only in Great Britain that the demand for coal has fallen. It has happened on the Continent too. Here again sales of oil have increased as the advantages from its use have been recognised. The discovery of natural gas in south-west France—this gas is to be transported throughout France and possibly to Spain and Switzerland—is going to reduce the demand for coal still more. The exploitation of the Sahara oil and natural gas fields will mean that an important source of oil is within direct pipe-line connection with the Continent of Europe and possibly Great Britain.

Such developments seem to come at an overwhelming speed once the main technical difficulties have been overcome, and we feel that progress of this kind cannot be held back.

In Great Britain, once the processes for using the cheaper, inferior coals have been developed and built at collieries, the British gas industry may begin to take increased interest in coal as a raw material, but as things stand now it is illogical to carry coal, often contaminated with large proportions of ash through the length and breadth of the country, when gas itself is far easier and cheaper to transport.

A high cost coal industry like our own must be streamlined and make available a product which can be used as it is or further processed at a really competitive price. Has the coal industry produced a refined solid smokeless fuel for the domestic grate or boiler other than Phurnacite? The gas industry has produced several in at shorter space of time, all of which are in great demand. The N.C.B. must come to grips with circumstances as they are.

Dead Heat?

ONE of the points made at the recent Gas Sales and Service Conference was the fact that the gas industry can no longer look to cooking for an expansion of its domestic load. And it was stressed that much of the industry's future success in the domestic market lay in establishing gas as the natural successor to coal as the fuel for heating Britain's homes. Lending point to these contentions was an item in Saturday's *Daily Telegraph* entitled 'Dead Heat in the Home,' written by a lady apparently baffled by the rival claims of the gas and electricity industries. Despite her somewhat alarming description of herself as 'an all-electric girl,' the writer expressed a very human wish to find out which was the better fuel for the housewife, by which she meant the fuel which was cheaper, quicker, cleaner, more convenient and more labour saving.

Having apparently never had the chance to use gas for domestic purposes, she put the following questions to the experts: 'Which is the cheaper fuel? It depends on the area. For example, electricity is less expensive in the South compared with, say, the East Midlands. For cooking, I was told, "gas is a flexible fuel." It gives instant heat and the flame can be seen. For heating, the new radiant convector blows out warm air through louvres at the top. But I have a radiant convector electric fire which does just that. Gas fires do not dry the air, say the experts. A winning point there. But my housewife friends tell me that gas—for both cooking and heating—is not as "clean" a fuel as electricity. Result? Deadlock. Which is the better fuel? I wish I knew.'

These queries, which seem to us both fair and sensible, suggest three things: That the industry should pursue the goal of price uniformity as diligently as possible; that the benefits of gas tariffs should be 'sold' more effectively; that this letter is a measure of the extent to which the *relative* popularity of gas for cooking is slipping; that the virtues of gas for space heating must be extolled ever more enthusiastically; that clean gas is needed more urgently than ever before. We hope B.L. will be inundated with letters explaining to her why gas is the best fuel, many from members of the industry who accept the sentiments expressed by Sir Harold Smith at Harrogate—that if you work for the gas industry you must be prepared to campaign for it.

No Smoking

WE are living in an age dedicated, officially at any rate to a policy of clean air. The Government clearly supports anything which will rid our skies of the pollution which is costing the nation £250 mill. a year, not to mention human lives. The National Society for Clean Air receives support from a galaxy of important people and organisations. Local authorities, albeit slowly, are enforcing clean chimney habits on their inhabitants. How strange and disconcerting, therefore, to read the words of Mr. J. S. Williams, Director of the Coal Utilisation Council, speaking at the National Fireplace Makers' Association. 'Well-designed surrounds, fitted with modern appliances,' he said, 'would stimulate the long-term demand for coal.'

It is a measure of Mr. Williams' powers of persuasion and the cleverly conceived propaganda of his organisation that such a direct affront to the Beaver Report and a glib disregard for national health can be expressed without arousing the indignation of all concerned with the improvement of living conditions in Britain. The coal interests which lend their support to the C.U.C. are obviously anxious to encourage the long-term demand for coal, but to persist in propagating this antiquated, uneconomic and unhealthy fuel for use in domestic grates appears to us to border on the criminal.

Unfortunately for the C.U.C. the traditional coal fire without which the Britisher was said to be so miserable has slipped several notches down the popularity poll in recent years. Heating methods using gas, electricity and oil are being accepted by the new generation of householders with an equanimity undreamed of even five years ago. This is not to say that solid fuel (sold we hope to the satisfaction and profit of many of the C.U.C.'s sponsors) will not play an important part in home heating for some time to come, but let it not be the bituminous coal implied by Mr. Williams in his speech. One is forced to conclude that the invitation 'Gentlemen, you may smoke,' may have had a special significance on that festive occasion.

Personal

MR. T. S. LING, a senior Director of George Scott & Son (London), Ltd., of the Balfour group of companies, left this country recently to visit Canada and the United States. In Canada, he will liaise with Dominion, Scott, Barron Ltd., the Canadian branch of the Balfour group; in America he will have extensive discussions with the Rietz Manufacturing Company of Santa Rosa, California. Mr. Ling heads the Rietz Division of George Scott & Son (London), Ltd., who manufacture in Britain, under licence, a wide range of equipment for the food and chemical processing industries.

MR. JOHN REED, a chemical engineering executive of George Scott & Son (London) Ltd., left England on September 28 for Australia, *via* America. He spent a week with the Rietz Manufacturing Company of Santa Rosa, California, and then flew to Australia. In Sydney he will meet MR. H. D. MACMURRAY, a senior Director of George Scott & Son (London) Ltd., already on a world sales tour, to assist in the development of George Scott & Son (Australia) Pty. Ltd.

MR. L. R. MORTIMER will represent Kelvin & Hughes (Industrial) Ltd. in the South Eastern Counties previously served by MR. A. R. MEWITT, who has now been appointed Assistant Technical Sales Manager. Mr. Mortimer has been a contracts engineer with Kelvin Hughes for the past two and a half years, before which he served in a similar capacity with Bailey Meters Ltd. The counties covered in the new appointment include Lincoln, Huntingdon, Cambridge, Norfolk, Suffolk, Essex, Herts, East Middlesex and the Luton area.

MR. ANDREW LAIRD has relinquished his post with the Combustion Engineering Association to take up another appointment. MR. T. G. EDMONDSON has been selected in succession to Mr. Laird as a Technical Officer of the Association.

MR. S. N. GRIFFIN has been appointed Sales and Service Engineer in Scotland for Teddington Industrial Equipment Ltd.

Change of address

The administrative and technical departments of Film Cooling Towers (1925) Ltd., moved to new premises on October 5. The new address is Chancery House, Parkshot, Richmond, Surrey. Telephone number RIChmond 6494/8.

Mr. Wynford Vaughan Thomas (second from right) and Mr. Philip Harben (extreme right), both masters of their respective crafts, are pictured here during a recent tour of Wales. They visited the site of the commemoration stone unveiled by the Duke of Edinburgh to inaugurate the North Wales gas grid, and also the Menai Bridge holder station. Also in the picture is Mr. T. Mervyn Jones, Chairman of the Wales Gas Board.

CORRESPONDENCE

Interconnecting mains

DEAR SIR,

I was interested to read the leading article in your issue of September 30 entitled 'Who Will Control Gas Production,' but must disagree with your statement in it that no provision has been made to pass gas from one board to its neighbour on a really large scale, although you state that connections do indeed exist, but would seem to be by accident rather than design.

I would refer you to the paper which Mr. R. Prince, former chief engineer of the South Eastern Gas Board, that I read to the Institution of Gas Engineers at their annual general meeting in 1956, where reference is made to a number of connexions between the mains of the South Eastern Board and those of the North Thames Board, including, among others, an 18 in. main directly connecting the Wandsworth works of the former, and the Fulham works of the latter, and a 30 in. main connecting the important Wandsworth to Worcester Park 30 in. transmission main of the South Eastern Board with the 36 in. Fulham to Slough main of the North Thames Board.

I would further mention that in 1957 I had the interesting job of giving evidence before a Parliamentary committee, on behalf of both boards, as to the necessity for provision being made for the laying of a possible future interconnecting main through the Dartford tunnel, now under construction, so that the mains systems of the two boards could be joined.

On the general subject of earlier interconnections, it may not be out of place for me to refer to a 36 in.-24 in. I had to lay as long ago as 1927, when mains' engineer of the former South Metropolitan Gas Company, to connect the East Greenwich works of that company with the Sydenham works of the former South Suburban Gas Company, both of which companies retained a separate identity until the industry was nationalised.

Yours faithfully,

J. A. Gould, Lt.-Col.,

Former distributing engineer, South Eastern Gas Board.

West Wickham,
Kent.

October 9, 1959.

Diary

October 28.—SOUTHERN G.C.C.: Civic Centre, Southampton. Special Meeting. 11 a.m.

October 29.—NORTH THAMES G.C.C.: City Hall, London. Council Meeting.

October 30.—LONDON AND SOUTHERN JUNIORS: Annual Reception and Dance. Caxton Hall, Westminster.

October 30.—JUNIOR INSTITUTION OF ENGINEERS: Pepys House, 14, Rochester Row, Westminster, S.W.1. Informal Meeting including Paper on 'Planning a Computer Job,' by M. G. Ferrand. 7 p.m.

Coleraine makes record profit—consumers benefit

IT was reported at the October meeting of Coleraine Borough Council (County Londonderry, Northern Ireland) that the trading returns of the Council's gas undertaking—which supplies the borough and the seaside resort of Portstewart five miles away—show a record profit in respect of the financial year just ended. It was the first time that the profit reached five figures.

And all despite severe competition, increased expenditure and several lean years.

Profit before allowing for taxation, was £12,123.

No price increase

It could have been £13,623. During the year increases in wages and rises in freight and general costs meant that the undertaking had to add £1,500 to its running costs but no increase was made in the price of gas or coke was imposed to offset the additional expenditure.

Gas sales were up by 7.2% on the previous year. This followed a decline in output during the previous two years. Sales of gas appliances were almost double the 1957-58 figure.

The rebate of 5d. per 1,000 cu. ft. which is to be made on all gas used during the last quarter of this year up to 240,000 cu. ft. will mean a payment by the undertaking of anything between 3s. and 5s. to the average gas user. The users of large quantities of gas will be charged less after January 1 next—the reductions fixed are 1d. and 2d. per 1,000 cu. ft.

The profit made by the undertaking during the previous year was £5,519. During the previous eight years, revenue exceeded expenditure only once—that for the 1952-53 financial year when a profit of £3,314 was made.

The Mayor, Alderman Lieut.-Colonel D. J. Christie, C.B.E., said at the October meeting of the Board that the returns were most pleasing, particularly as they did not have to increase the price of gas or residuals since 1957.

If the cost of coal freight charges did not rise, he said, he thought they would be in an even happier position this time next year. He added the trading results were a tribute to the Manager of the plant, Mr. T. R. Cameron, and the members of his staff.

The Council adopted a committee recommendation suggesting a payment of a rebate to gas users on all gas read during the quarter beginning on January 1 next.

The recommendation was accepted.

CHOICE OF FUEL IN CO. DURHAM

TENANTS of Council houses at Gateshead, Co. Durham, are to be given the choice of gas or electricity for cooking. The decision followed a complaint by the North Eastern Electricity Board that on some estates where electricity mains had been laid, the tenants had not been allowed to choose between gas and electricity.

The Board claimed that the Council should pay £7,761 towards the cost of supplying electricity to these estates. The Board, however, said it would provide electric mains free of charge if tenants were allowed to make their own choice between gas and electricity.

Senior buyers' course

The first Scottish senior buyers' course will be held by the Purchasing Officers Association at the Golden Lion Hotel, Stirling, on Thursday and Friday, November 19-20.

Among the papers to be given will be Communications and Negotiations, Trends in Purchasing Management, Current Economic Factors in Purchasing and Stock Control.

Gas Exhibit at clean air show

THE ways in which gas helps the householder and the industrialist to meet the requirements of the Clean Air Act will be shown at the Gas Council's exhibit (Stand Nos. 3 and 4) at the National Society for Clean Air's Diamond Jubilee Conference and Exhibition in London's Seymour Hall from October 20-22.

Photographic panels with captions will show the advantages of small bore central heating; the Halcyon heating system; multipoint gas water heating and thermostatically controlled coke-burning boilers. In addition there will be a large general panel showing how cheaply appliances which meet the requirements of the Clean Air Act can be installed and how other appliances can be converted.

Appliance display

A display of appliances to support the panels will comprise an Ascot 709 M/P water heater; a 271 Century fire by R. & A. Main Ltd.; an Economatic gas boiler by International Boilers & Radiators Ltd.; the Super Thermatic coke boiler (Robert Taylor & Co. Ltd.) and the 16 Newbold fire (Sidney Flavel & Co. Ltd.).

The new Gas Council colour film, *Window to the Sky*, will be shown at each programme of a series of film shows which has been arranged for delegates. The films will be screened at 4.45 p.m. daily in the David Fisher Hall (beneath the Western Synagogue, Crawford Place, W.2) throughout the duration of the conference.

Coloured street lighting—'a sin'

THE erection of coloured street lighting on tall columns through the village High Street at Knowle would be a 'sin of great proportions,' Ald. E. N. Hiley told members of Solihull Council on Tuesday night.

Ald. Hiley was commenting on a report from the authority's Public Works Committee, that the Ministry of Transport had stated that it was unable to make a grant towards the erection of lantern-type lighting in Knowle's High Street, similar to that which exists in High Street, Solihull. The Ministry had refused, it was reported, to make a grant towards other than normal street lighting.

HOME SAFETY PLAN STARTS IN CANADA

A CAMPAIGN to make Ontario residents more aware of the hazards to be found in the home got under way at a luncheon in Toronto, Canada, recently. The 'Home Safe Home' campaign, inaugurated by the Ontario Safety League and the Canadian Gas Association moved into high gear with the presentation of 40,000 'Home Safe Home' booklets to the League by Mr. N. E. Tanner, President of the Canadian Gas Association.

Opening gun of the campaign was fired by Dr. Robert Imrie of the Hospital for Sick Children, Toronto, in an address directed to officials of many Ontario organizations interested in promoting home safety throughout the province.

Mr. George Ham, Director of Child Safety, Ontario Safety League, stressed the fact that more than five times as many fatal accidents occur at home as compared with work. 'The donation of the home safety booklets by the gas industry through the Canadian Gas Association has been,' he said, 'a major step in allowing them to get the campaign under way.'

New Zealand oil search

THE search for oil in Taranaki, New Zealand, recently took a promising turn with the discovery of gas at Kapuni No. 1 well. Reports said that gas has been struck at 12,400 ft., and was being burnt off. Dr. J. H. Irving, general manager of Shell-BP-Todd Oil Services, said the presence of gas did not mean oil had been found, although its discovery was a promising sign.

Irish warm air heating

A new American method of warm air heating by gas is being introduced by Bangor (Co. Down) Borough Council's Gas Department. A new bungalow has been chosen for the experiment.

Warm air apparatus is to be installed on a sale-or-return basis and the occupier will be supplied with gas free of charge for 12 months.

SUCCESSOR TO 'FARE PLAY'

AFTER a phenomenal success with its three-act cookery comedy *Fare Play*, Radiation Ltd., follows up with another winner entitled *Fare and Warm*, this time publicising a whole range of domestic gas appliances including New World cookers, water heaters, space heaters and a Radiation Ductair central heating unit.

Good reception

The curtain went up for the first time on this new show at Barnstaple, where it was enthusiastically received, despite a slight exhaustion among the population after one of the most exciting election tussles in the country.

The two attractive young stars of *Fare Play*, Rosemary Murray and Ken Haward, appear again in this new production, and the show's tour of the South-West will include Bristol, Exeter, Bridgwater, Weston-super-Mare, Yeovil, Truro, Bath, Paignton and Evesham.

Scottish dealers allege 'threat to employment'

THE Scottish Authorised Retail Dealers Association, which claims to represent 90% of the dealers in gas appliances, issued a statement after a meeting in Glasgow last week, saying: 'This recent policy, in effect, creates a threat to employment and to the well-being of the gas industry.'

Confirmation

Officials confirmed that the Board's policy change affected the commission paid them. One said: 'We won't be able to pay salesmen to sell appliances, and everyone will suffer—the retailers, the Board, and the manufacturers of the appliances.'

A Scottish Gas Board spokesman in Edinburgh said that the Board had recently readjusted the commission on the sale of gas cookers because dealers had concentrated on selling them in preference to other products. The commission on gas cooker sales had been higher than for other appliances, so it had been cut to build up sales of other commodities.

The Watford plant

With reference to the leading article 'Complete Gasification at Watford,' which appeared in the August 19 issue, we are requested to point out that there is no connection between the Power-Gas Corporation Ltd., on the one hand and the G.I. companies and their licensees, the International Furnace Equipment Co. Ltd., on the other.

Secondly, the two groups have developed their respective plants quite separately over a long period of years.

ANOTHER ELECTRICITY *v.* GAS ROW IN SCOTLAND

MR. W. NICOL BAIRD, General Manager of the Central Division of the Scottish Gas Board, has told the Town Council of Buckhaven and Methil (Fife), that 'the more all-electric houses there are, the more will the price of electricity, as well as gas, be driven upwards.'

Buckhaven and Methil Town Council, who proposed putting in all-electric houses when they re-developed Old Buckhaven, have decided to reconsider policy on the type of power.

'Very disappointed'

Mr. Baird told the Town Council: 'We are naturally very disappointed to learn of your recent decision to build some all-electric houses. We are not asking for all-gas houses. We are merely asking for freedom of choice for the consumers.' Mr. Baird said that to provide the additional load of electricity for widespread all-electric schemes meant more money being invested in power stations and distributing cables. That was new capital expenditure to replace good plant purchased by public money, by the local authorities, prior to nationalisation and by the gas industry since nationalisation.

Hinting at the troubles in the Fife coalfield, Mr. Baird said: 'It is not our intention to abandon coal. We will use a lot more coal if local authorities do not make all-electric schemes and if the demand for gas goes up, and if the Coal Board treats the gas industry as favourably as they treat the electrical industry.'

He said that many people were crying upon the Government to bring out a fuel policy, but the local authorities had this in their own hands.

LONG SERVICE

The 11th annual dinner of the Foxboro-Yoxall '10-Year Service' Club also marked the company's 25th anniversary. Among the 117 members were six who had completed 25 years' service, and 17 new members.

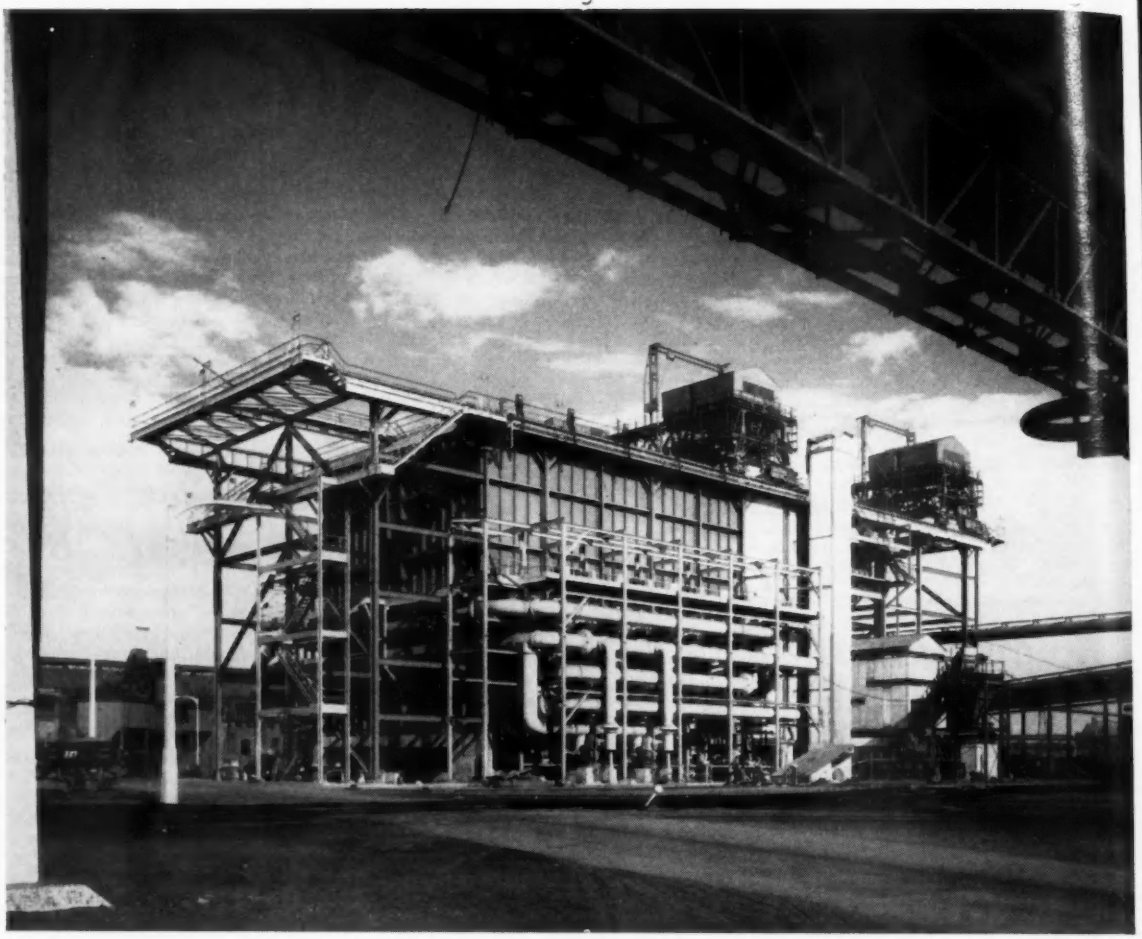
Mr. L. S. Yoxall, Chairman and Managing Director of Foxboro-Yoxall Ltd., expressed thanks to the long-service members for their important part in the company's advance in the British instrument industry.

Television and the W.M.G.B.

LEGAL advisers to the West Midlands Gas Board are considering the possibility of paying compensation to residents whose television viewing is affected by the Board's gasholders at Pleck, Walsall.

Television waves bounce off the sides of the holders, so that pictures become hazy and sometimes disappear. A Board spokesman has said, 'There is little we can do. We considered having a television mast built above the holders to act as a repeater station, but apparently that would make no difference.' Viewers will probably have to have special aerials installed and have their receivers adjusted.

The photograph shows the new clean air mobile demonstration unit recently put into commission by the Solid Smokeless Fuels Federation. The unit has just completed a tour of a proposed smoke control area in the Borough of Brentford and Chiswick and is now travelling North to take part in the Tees-side clean air campaign, which commenced last week. The exhibition unit is entirely self-contained; exhibits include three types of modern smokeless domestic appliances—an open fire, a free-standing convector and an openable stove—all under fire and burning solid smokeless fuels. Also on view is a modern domestic boiler with diagrams of various forms of heating systems. Solid smokeless fuels authorised under the Clean Air Act are also displayed. The exhibition unit is staffed by trained demonstrators who are fully qualified to deal with enquiries regarding domestic heating and clean air problems.



By courtesy of Henry Balfour & Co. Ltd.

The Balfour-Lecocq tower box purifier plant, showing five of the towers and a stocking tower behind the lift shaft. The two lifting cranes running above the towers appear on the right and the oxide conveyor plant in the right foreground.

Tower Purifiers at Beckton

THE commissioning of the new Balfour-Lecocq tower box purifier plant at the Beckton works of the North Thames Gas Board recently, by the Chairman of the Board, Mr. Michael Milne-Watson, completes the fourth and largest plant of this type to be installed by the Board. Other plants at Bromley, Bow Common and Southall have been successfully operating for several years and have showed the performance to be expected from this particular system.

Considering future needs

The choice of this type of plant is the result of a careful review of the future needs of the gas industry in general and of the rôle Beckton will play in gas production in the years to come. The two main considerations were, the availability of a certain type of labour and the flexibility of operation to allow the purifiers to be worked with the greatest possible efficiency, when processing crude gas of varying sulphur content. The plant as installed, is worked as three streams of five towers but with very little modification of the pipework it can be converted to five streams of three towers, for the purification of carburetted water gas or other gases of lower hydrogen sulphide content.

In a gasworks the size of Beckton, it is possible to give continuous employment to a gang of men changing purifier boxes of the conventional type, so, provided the particular type of man can be found, the working of the conventional box purifier may not be the problem it is in other works. Nevertheless, any system which could be mechanised and so cut down the necessary manpower was to be welcomed. By the help of mechanisation the Balfour-Lecocq system has reduced the labour needed to four men of a type more easily recruited, and the manpower needed to change a unit of purification plant, in this case a tower, to 16 man-days, at least half that needed for a box purifier.

Volume of gas halved

The Board operates its purifier plants on the volume of gas passing through a tower as first-taker and this is normally equal to about 270 mill. cu.ft. To prevent there being any risk of the oxide hardening and so delaying the emptying of an oxide tray in its tippler, this volume of gas has been halved to approximately 130-

135 mill. cu.ft. The saving in time and manpower has made this possible without increasing the cost of operating the plant per therm of gas processed.

Built and designed by Henry Balfour & Co., Ltd., of Leven, Fife, the plant consists of 15 towers each holding 16 trays, with a total capacity of 30 mill. cu.ft. of coal gas per day. Unpurified gas from the horizontal retort houses is brought by a 48-in. main and is divided into three streams, in each of which are five towers. After purification the streams join at a common outlet and the gas passes to the holders through a 48-in. steel main.

Mechancial handling

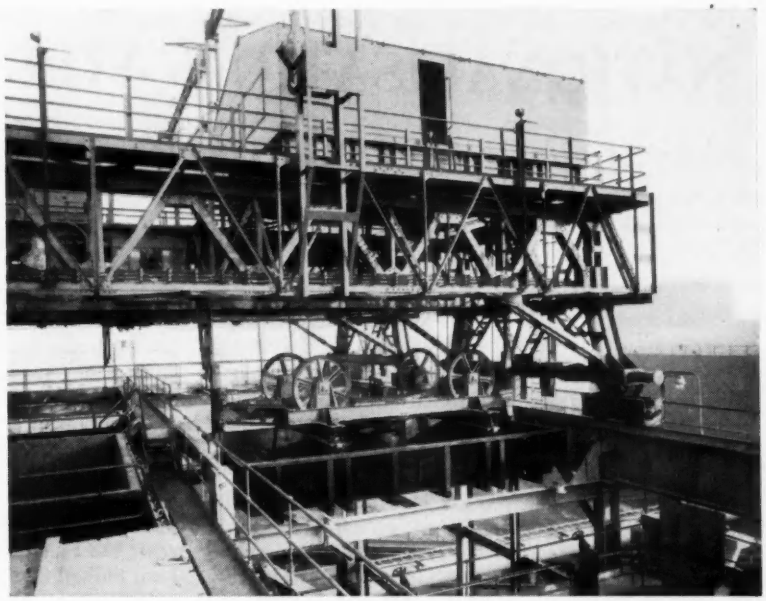
Each of the 16 trays in a tower carries a charge of 25 to 30 tons of bog ore/oxide mixture, making the total charge per tower of over 400 tons and more than 2,000 tons per stream. To handle these large quantities of oxide an up to date mechanical handling system has been installed, consisting of two 55-ton overhead cranes—one standby—running on rails above the boxes, a tray tippler, oxide crushing plant and a belt conveyor tray loading system.

New oxide brought from the oxide store is unloaded and transported by belt conveyor to the empty tray standing on a special mobile table. A shuttle conveyor and the movement of the tray at right angles allows it to be filled with the minimum of effort. The full tray is lifted by crane to the top of the towers and is carried to the individual tower being charged and lowered in position. A tray from a tower being emptied is taken to the tippler and emptied into a large hopper, capable of holding the oxide from two trays.

Oxide treatment plant

It is then lowered to the mobile table at ground level. An oxide treatment plant crushes and disintegrates the semi-spent oxide and returns it to the tray for return to the tower. The refilled tray will be placed in a stocking tower until the emptying of the tower is complete. It takes some 40 minutes from taking a tray from a tower to placing it in the stocking tower, of which 30 minutes are spent in filling the tray. The time taken for the complete changing of a tower is four working days. No spare trays are kept in stock and to avoid corrosion, each tray is lined with 1½-in. of concrete.

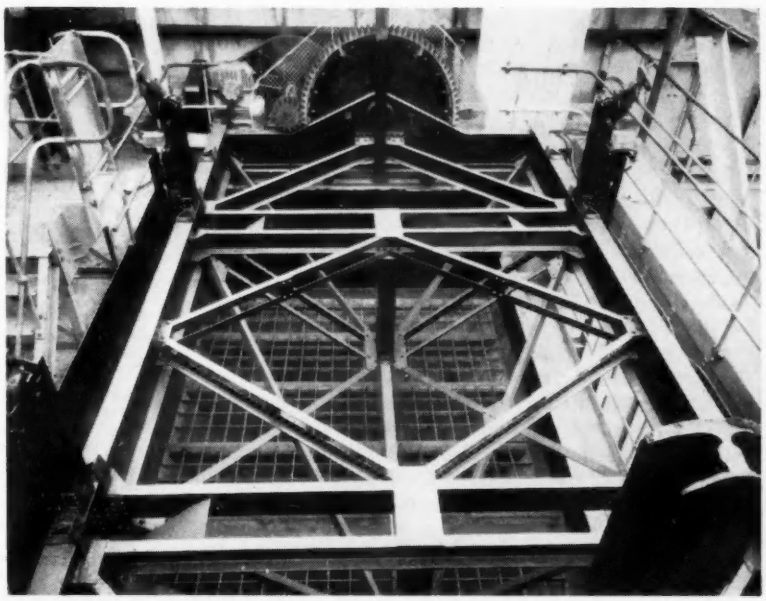
The complete installation is particularly compact and arranged in two rows, one of ten towers and the other of five towers, two stocking towers and the oxide handling plant, has made possible a great saving in ground space. It actually replaces purifiers of the original Beckton works constructed some 90 years ago.



On the top of the towers showing the crane and the lifting beams to which the purifier tray is attached for raising or lowering. All control is from the cabin including the attaching of the tray to the crane.

Backward rotation of the towers is practised and to enable this to be carried out as frequently as the control of the process demands, hydraulically-operated change-over valves which are virtually push-button controlled, have been fitted. By-pass or 'jump' bridle connections and valves allow a 4-tower rotation in any gas stream when a tower has been taken out for discharging.

All gas valves are protected by water valves and a built-in purging system provides inert gas at the rate of 25,000 cu. ft. per hour. Two Holmes-Connerville meters measure the gas at the outlet of each stream.



Looking down on the tray tippler. The tray is held in place by the four vertical girders, on which are mounted eight wheel operated tightening devices. The top of the hopper can be seen underneath and the motor and reduction gear in the background.

NATIONALISATION FOR A DECADE

—an Analysis of the Gas Industry's Reports and Accounts

By R. KELF-COHEN, C.B.

THE Report of the Gas Council for the year ended March 31, 1959, contains a fascinating review of the first few years of nationalisation. Most of this article will be devoted to comments on the achievements of those ten years; but first a few remarks on the results of the working of the past year.

It is a great pity that the gas industry has ended its unbroken sequence of annual surpluses and for the first time incurred a deficit. This is serious, because the factors which are continuing to operate are not likely to convert the deficit into a surplus during the current year. It is surprising that the Gas Council attributes the fall in gas sales 'chiefly to the fall in industrial activity and the relatively mild weather.' (Paragraph 386.) As later statistics in this article will show, the number of industrial consumers has steadily declined each year.

It was too much to hope that the rise in sales of gas to the declining number of industrial consumers would continue uninterruptedly. It is to be hoped that this year's fall was due to the slight recession of last year but the Council itself admits (paragraph 271) that 'technical developments in the use of fuel oil in particular has enabled oil to pursue markets in which gas has so far played a predominant role.' There is no industrial recession this year so we shall know in 1959-60 whether the fall in industrial sales is due to temporary or permanent causes.

Main Reason

It is sad that last year's 'relatively mild weather' should be quoted as a main reason for the fall in gas sales. For, in fact, there was little difference in the years 1957 and 1958 on average. In fact, the calendar year 1958 was 0.9° colder than the year 1957. It is true that the first 13 weeks of 1959 were 1.7° warmer than the corresponding period of 1958. But over the whole financial year 1958-59 the temperature could have made but slight difference.

If it did make a difference, what will be the effect of the extraordinary summer through which we have just passed? In the first 25 weeks of the current financial year, total gas available at gasworks was 236.8 thousand mill. cu.ft. as against 246.8 thousand mill. in the corresponding period a year ago—a decline of over 4%.

The country's total fuel consumption fell sharply from 253.9 mill. tons of coal, equivalent in 1956 to 246.6 mill. in 1957; but it recovered in 1958. All fuels (even oil) suffered a decline in 1957, with the exception of electricity. Gas improved somewhat in 1958 but, of course, not on the scale of electricity or oil. The industrial recession had its greatest effect on total fuel consumption in 1957—and not in 1958. One may suspect that the 20% increase in the rise of oil consumption in 1958 over 1957 must have been the main cause of the fall in sales of industrial gas. Oil consumption is, of course, continuing to grow and in the first eight months of this year was 14% higher than in the same period last year.

But the main purpose of this article is not to deal with the current problems of the gas industry. I have not been in close touch with the industry for a number of years but I have followed its progress in its publications. I am limited therefore to the evidence contained in those publications. The ten years' review in the Gas Council's report provides a valuable basis for a series of tables and comments. I knew the area boards when they were launched ten years ago. To me it is fascinating to see the different routes they have followed since. The gas industry has been fortunate in its decentralised organisation and the differing results must in large part be due to differences in policy, organisation and personnel. The influence of local conditions must also have been important.

Diversity of Results

The public tend to regard the gas industry as a unit—just as they regard coal and electricity. They have more ground for doing so in the case of these other industries. In gas the experience of the last ten years has produced an amazing diversity of results.

One small point. It was unfortunate that the gas industry was nationalised in May 1, 1949. That means only 11 months in the financial year 1949-50. So all the figures which follow deal only with the nine years between April 1, 1950, and March 31, 1959.

During that period total sales of gas increased from 2,460 to 2,605 mill. therms—an increase of 6%. But this average conceals an incredible variety of results between the 12 area boards, as is shown by Table I.

TABLE I.—SALES OF GAS

	1950-51 (mill therms)	1958-59 (mill therms)	Percentage Change
Scottish	205	187	− 9½
Northern	146	168	+15
North Western ...	338	351	+ 3½
North Eastern ...	144	143	− 1
E. Midland... ...	247	294	+19
W. Midland ...	297	323	+12
Wales	71	93	+31
Eastern	125	139	+10½
North Thames ...	380	399	+ 5
South Eastern ...	276	284	+ 4
Southern	114	113	− 1
South Western ...	117	111	− 5½

No doubt the boards will have reasons to give for the rise or fall in sales of gas. Scotland is a difficult area but so is the other Celtic fringe in Wales. On the

other hand about five-sixths of the gas in Wales is bought—mostly from coke ovens—probably at prices which compare favourably with the cost of manufacture. It is interesting to note that the two other boards with the greatest increases in sales—East Midlands and Northern—draw a large part of their supplies from coke ovens. The increase in the West Midlands can be attributed to its booming industries with their increased demands for gas. But what about the Eastern Board with its vast rural areas? Perhaps the large number of New Towns in its area have helped to push it into fifth place for increases in sales. This is borne out by the fact that the Eastern Board had the largest percentage of increase in number of consumers between 1950-51 and 1958-59, as is shown in Table II.

TABLE II.

	Increase in number of consumers	Percentage.
Scottish	−1,327	−0.1
Northern	59,501	+ 9
North Western	99,754	+ 6
North Eastern	13,246	+ 1½
East Midland	151,488	+14
West Midland	107,172	+10
Wales	65,689	+15½
Eastern	106,336	+16
North Thames	104,573	+ 6
South Eastern	133,520	+ 9
Southern	79,646	+14½
South Western	23,663	+ 4

But increase in number of consumers is by itself no criterion. It is true that the Wales, Northern, East and West Midlands and Eastern Boards all had substantial increases both in number of consumers and in sales of gas. But the Southern Board had the third largest percentage increase in number of consumers and yet sold less gas than in 1950-51.

Reasonable Yardstick

A familiar test of comparing the relative position of gas undertakings is the number of consumers per mile of main.* I have always thought this rather a crude test, because there are consumers and consumers, and of course it is much fairer to compare the number per mile in the same area over a period of years. Nevertheless, taking the country as a whole, I presume it is a reasonable yardstick of the load factor of the distribution system.

The following table gives some interesting figures:—

TABLE III.

	Consumers per mile of main		Percentage of change
	1950-51	1958-59	
Scottish	184	160	−13
Northern	144	122	−15
North Western ...	151	137	− 9
North Eastern ...	133	116	−13
East Midland ...	147	130	−12
West Midland ...	149	136	− 9
Wales	139	115	−17
Eastern	126	127	+ 1
North Thames ...	207	196	− 5
South Eastern ...	157	150	− 5
Southern	119	107	− 7
South Western ...	138	113	−17
Total	153	138	−10

One is surprised that Scotland is second only to North Thames; the latter would be expected to have the highest number of consumers per mile of main. There is a general idea that Scotland is an area so widely scattered that it has special problems of its own; Sir Harold Smith at a Press conference dealing with the Report and Accounts suggested this. But these figures show that the Scottish Board supplies gas to more densely populated urban areas than any Board except North Thames.

Increase and Decrease

Six boards have suffered a greater reduction in the number of consumers per mile than the national average; six have suffered a smaller reduction. It is interesting to note that the three Boards which have shown the greatest increases in sales of gas—Wales, Northern and East Midlands have lost more than the national average. Indeed, Wales has lost the largest percentage (equalled only by Southern); yet Wales has increased its sales by 31% while Southern has been static. The Eastern Board occupies the unique position of having increased the number of consumers per mile of main. That Board has had the largest percentage increase in the numbers of consumers. Presumably the five New Towns have put their new mains to good use—to as great an extent as the old mains.

Finally, let us look at the capital investment position of the various boards. They did not start even at nationalisation. Those who inherited local authority assets got them cheap. North Western's assets on vesting were valued at £19.2 mill. and West Midlands at £12.1 mill. On the other hand, North Thames were valued at £54.4 mill. and South Eastern at £32.7 mill. The capital liability per therm sold was therefore about three times as high in the South Eastern area as in the West Midlands.

At present one-third of the depreciated value of the assets vested on May 1, 1949, are in the North Thames area and one-sixth in the South Eastern area. In other words, though they sell about one quarter of the country's gas, they are saddled with half the capital liability left over from vesting date.

But what has happened in capital investment since vesting date? Table IV shows the total capital liability of each board on March 31, 1959, together with the volume of its sales and the burden of this capital expressed as number of therms sold per £1 of capital.

Seven boards have a higher average capital liability than the national average; five have a lower average. West Midlands having got its assets cheaply have invested modestly in comparison with the other larger boards. It acquired its assets in 1949 more cheaply than the South Western or Southern Boards, which are now selling little more than one-third of the gas sold by the West Midlands. The Northern Board obtained its assets cheapest of all (even cheaper than Wales) and for its size has invested on a smaller scale than any other Board.

---

* Five boards had fewer consumers in 1958-59 than in 1957-58. These were Scotland, Northern, North Western, North Eastern and South Western. Scotland, indeed, has been losing consumers since 1954-55. In that year the number was 1,243,871, which in 1958-59 had declined to 1,199,638—a decline of 44,233.

The number of industrial consumers for the country as a whole has been falling steadily year by year. In 1951-52 they were 111.8 thousands and in 1958-59 they had fallen to 92.4 thousands. In recent years some boards have been losing industrial consumers at a rapid rate. Between 1954-55 and 1958-59, North Thames industrial consumers declined from 30,489 to 25,577—a loss of nearly 5,000. In Scotland numbers declined from 8,098 in 1954-55 to 5,614 in 1958-59—a heavier percentage decline than in North Thames. But, curiously enough, sales of industrial gas in Scotland increased despite the heavy fall in the number of consumers; in North Thames sales declined though not very appreciably. Indeed, North Thames was unique in selling less industrial gas in 1958-59 than in 1954-55. Is the competition of oil more fierce in the London industrial area than elsewhere?

TABLE IV.—CAPITAL LIABILITIES OF AREA BOARDS.

Board	Sales of gas 1958-59 (mill. therms)	Capital liability March 31, 1959 (£ mill.)	Number of therms sold per £1 of capital
Scottish ...	187	32.1	5.85
Northern ...	168	20.6	8.1
North Western .	351	69.9	5
North Eastern .	143	25.3	5.65
East Midland .	294	42.8	6.87
West Midland .	323	38.8	8.32
Wales	93	19.4	4.8
Eastern ...	139	30.6	4.54
North Thames .	399	88.1	4.53
South Eastern .	284	59.4	4.78
Southern ...	113	30	3.78
South Western .	117	32.1	3.64
National total .	2,604	489.1	5.31

The Report of the Gas Council (paragraph 471) has expressed the weight of capital charges as pence per therm of gas sold. It has risen from 1.86 pence in 1949-50 to 4.40 pence in 1958-59. This is a serious charge on the revenue of the industry. But the above table shows that in this, as in other matters, there is great diversity between the boards. On the basis of the national average of 4.40 pence the capital charges on the West Midlands Board is less than 3d. per therm of gas sold; but on the South Western Board it is more than 6d. per therm. If the volume of sales contracts further and capital liabilities are increased further, the weight of these liabilities on revenue might become intolerable.

The boards are autonomous. An outsider cannot say how far they let down their hair in the presence of each other. The various tables in this article show great diversity in the results of the Board's operations. Some seem to obtain better results than others. It would be most interesting to have a forum at which each Board explained fully and frankly why its results were as shown in these tables. If the tables in this article stimulated useful discussion I should be most satisfied.

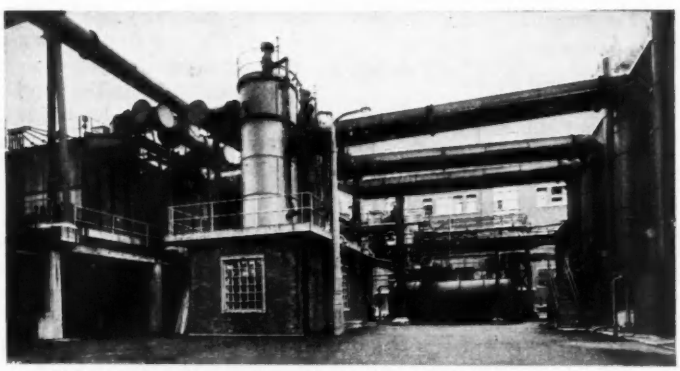
NEW BOOKS

Gas Fitting (Intermediate), by D. M. Holloway, B.Sc., M.Inst.Gas E. The English University Press Ltd. Price 21s.

THIS is a manual of gas fitting written with the candidate for the City and Guilds Intermediate examination in that subject in mind. It is a workmanlike production and well illustrated. The worked-out examples of questions from previous examination papers are helpful in illustrating the points under consideration. The later sections, dealing with practical applications and giving details of the actual fixing of appliances and pipework, are likely to be of interest to many who find this side of the subject of more immediate application.

CONTRACTORS TO THE GAS INDUSTRY FOR OVER 100 YEARS

SPECIALISTS IN ALL TYPES OF GASWORKS PLANT



The riveted steel mains shown in the illustration were erected by us at Bromley-by-Bow Gasworks.

Photograph by courtesy of the North Thames Gas Board.

SAML. CUTLER & SONS LTD.

70 VICTORIA STREET WESTMINSTER, S.W.1

PROVIDENCE IRON WORKS MILLWALL, E.14

The British Coal Utilisation Research Association

COAL:

A COLLOID AND A CHEMICAL

The eighth coal science lecture was delivered to the Institution of Civil Engineers last week. The lecture embodied the thoughts of a distinguished chemist, having life-long experience of surface and colloidal phenomena, on the results of coal research and their possible fields of application. The following is an abstract.

By Sir Eric Rideal, F.R.S.

SIR ERIC recalled the stress laid on the colloidal aspects of coal by the late Dr. D. H. Bangham and expressed surprise at the underlying chemical similarity of coals despite their differences in origin. He pointed out that at some stage in their history, the colloidal portions of coal must have undergone phase inversion, from an aqueous emulsion to a 'grease' in which the continuous phase is a solid. The progressive aromatisation during maturing seemed to imply intramolecular mobility, at least in the earlier stages.

The lecturer then discussed the structure of coal on an atomic scale, and the porosity that partly resulted from the irregular arrangement of molecules. The porosity occurred in three distinct size ranges, the smallest of which contributed most of the internal surface. As a result of this the Kelvin equation for capillary size distribution was not applicable to the most important part of the pore structure. He discussed the possibility of blocking these very small passages. Sir Eric went on to consider the dimensional changes that occur when vapours are absorbed on the internal surface of coals and charcoals, a subject of great interest to Dr. Bangham. He discussed at some length the concept of swelling pressure, the thermodynamics of the phenomenon, and its relation to the structure of the material. It was suggested that in the low rank coals, oxygen-containing groups might tend to anchor sorbate molecules and thus form nuclei for hydrogen-bonded islands of two-dimensional liquid. The lecturer then suggested that the ready elimination of hydrogen from coal by treatment with 50% aqueous sulphuric acid, and other examples of fairly complete chemical reaction, supported the gel theory of coal structure.

Turning to the combustion and gasification of coals, Sir Eric noted that the greater part of the heat of combustion of carbon was released subsequent to formation of carbon monoxide, and that this effect was fortunate since gases were more conveniently handled. Smokeless combustion might be promoted either by enlarging the pore structure or by dehydrogenating the coal.

Following a discussion on the relative ease of dispersing the coal gel, *e.g.*, in solvents, and the relation of this to the preparation of coal/oil fuels, the lecturer then considered coal preparation by flotation, in the light of surface wetting considerations. Oxidation made the coal more hydrophilic, and he suggested that a study of the changes in wetting angle during chemical reduction followed by oxidation might lead to useful results.

A brief reference was made to complete gasification of coal and the study of slags, the possibility of using surplus coal in conjunction with oil as colloidal fuel, and the possibility of reducing the cost of pulverised fuel.

An interesting final section was devoted to the possibility of making chemicals directly from coal; it was suggested that the advantage of basing chemical industry more fully on indigenous raw materials might justify special methods of costing coal for this purpose. Sir Eric considered that the quantities of coal potentially required for this purpose need not be regarded as negligible. Furthermore, there were the possibilities inherent in the Fischer-Tropsch and similar processes. Selective hydrogenation offered yet another approach, and the work of Bergius on hydrogen from the reaction of superheated steam with coal was mentioned. Other ideas broached were: use of the carbon ring systems in coals as hydrogen carriers in hydrogen transfer reactions, during the first stage of hydrogenation; enriching the oil vehicle, used in coal hydrogenation, by aromatics to act as hydrogen carriers for the same stage; use of ring fission (at higher temperatures), *i.e.*, first adding peripheral hydrogen to destroy resonance energy, then opening some of the rings to form chains, and finally freeing the chains.

The 'Empiric with Not a Particle of Science' who Pioneered the G.L.C. 150 Years Ago

By M. SCHOFIELD, M.A.Oxon., B.Sc., F.R.I.C.

JUST one-and-a-half centuries ago the history of public gas-lighting began with an opening chapter by the indefatigable Frederick Winsor when seeking a charter for a company. Up to 1809 Winsor had taken out four patents for 'extracting inflammable air from all kinds of fuel,' and had been active with his lecturing, pamphleteering, and demonstrations of gas-lighting at the Lyceum and at Pall Mall. His pamphlets were somewhat fantastic at times, while his lectures were deemed by critics 'dull and uninteresting,' with Winsor himself called 'a mere empiric with not a particle of science.' Yet Winsor's vigorous canvassing for setting up a National Light & Heat Company roused sufficient interest and opposition for a Parliamentary Committee of Enquiry to come into being, in 1809, as a first step to the Gas Light & Coke Company which came a few years later. Boulton and Watt saw in Winsor's scheme an encroachment on their activities, getting Henry Brougham as counsel in opposing the Bill and an Edinburgh University man to write adversely in the *Edinburgh Review* in January, 1809. Yet in looking back today we see how Winsor, despite his lack of technical knowledge or training, was far more foreseeing than Boulton and Watt, who only visualised separate gas-making units for houses or factories.

Banished Monopoly Scare

Although gas-lighting histories refer to a National Light & Heat Company as first title with the modern name of the Gas Light & Coke Company only used from the charter of 1812, this title was included during the proposals of 1809. Thus we find G. Sidney of the Strand publishing in that year some 'Remarks on a Bill for Incorporating the Gas Light & Coke Company,' a pamphlet which summarises the whole project with its advantages. It told how no claim to an original discovery was made, and went on to banish the ideas of critics that a monopoly would be created, since 'the products or the means of obtaining them would be open to all the world.' The committee for conducting the Bill pointed out that Murdoch had no special claim, that 'philosophical fireworks' had been demonstrated in 1781, and that the process of lighting by means used in Pall Mall 'may challenge every competitor for its simplicity and is unrivalled for its security.' The report went on to criticise Boulton and Watt's efforts up to then, with only a few factories lighted 'in the lapse of many years,' and since 'individuals granted powers would be more likely to seek a monopoly.' Rival contractors or individuals would obviously be useless for lighting a city it was claimed, while the proposed company would provide cheaper fuel for the poor, large quantities of pitch for the Navy, and liquor for the dyeing industry. About 600,000 chaldrons of coal would be coked per year at first, it was estimated, the coke being sold at 30s. per chaldron.

This publication summed up the aspirations of the committee which sought 'that it may be permitted to observe to your Majesty that a great and rich Company sustained by exclusive privileges is the only means capable of obtaining all the possible advantages—otherwise the process of Mr. Winsor would be adopted by private individuals and probably result in serious and grave accidents.' Although when the charter to found a company was eventually granted, after much delay, the capital was only one-fifth that of Winsor's imaginative scheme, the foundation for public gas-lighting had been fixed. Winsor's service with the Gas Light & Coke Company was short-lived; for although the directors could not easily dispense with the founder, they grew tired of the habits and ill-conceived experiments of a pioneer who was neither administrator nor engineer. Nor was Winsor's supporter in his project, namely, Frederick Accum, to survive him; for Accum was too impetuous and volatile and his basic science considered too rough for satisfying fellow directors. Yet Accum, it will be remembered, was the first to mention gas purification in his *System of Theoretical and Practical Chemistry* of 1803, in which which lime was suggested, while his *Treatise on Gas Light* of 1818 showed a purifier with both lime slurry and another alkaline solution put forward. With Accum later publishing a volume on *The Process of Manufacturing Coal Gas* and a year later in 1920 his *Treatise on the Adulteration of Food*, it certainly looked as if he was not put off by his forced resignation from the G.L.C. Both Accum and Winsor were interesting characters adding piquancy to the early history of our national industry.

B.S.I. Publication

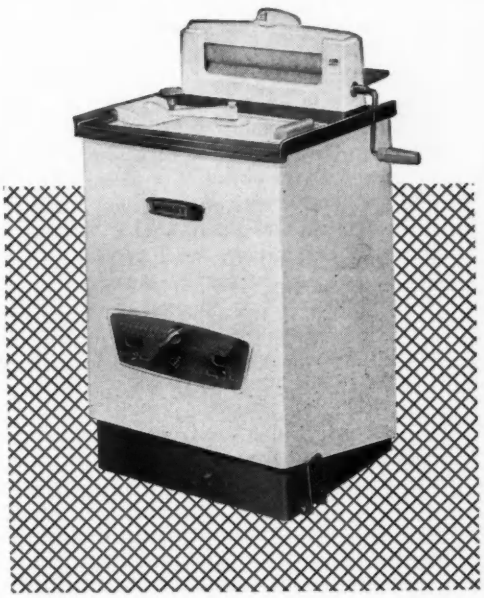
A WELCOME feature of a revised publication *British Standard for Asbestos Cement Flue Pipes and Fittings. Heavy quality.* (*B.S. 835: 1959*) is an extension of its scope to include a selection of sizes up to 24 in. diameter. In previous editions of this widely-used standard, the largest diameter had been 12 in. The elimination of little-used sizes of fittings will reduce stock-keeping difficulties without causing hardship to users.

The 36-page, fully-illustrated standard recommends that asbestos cement flue pipes should not be used where the flue temperature is high, or where there is direct flame impingement in the flue wall.

The tests deal with straightness, regularity of thickness and diameter, soundness, bursting strength and water absorption. B.S. 835 concludes with an appendix containing recommended methods of fixing.

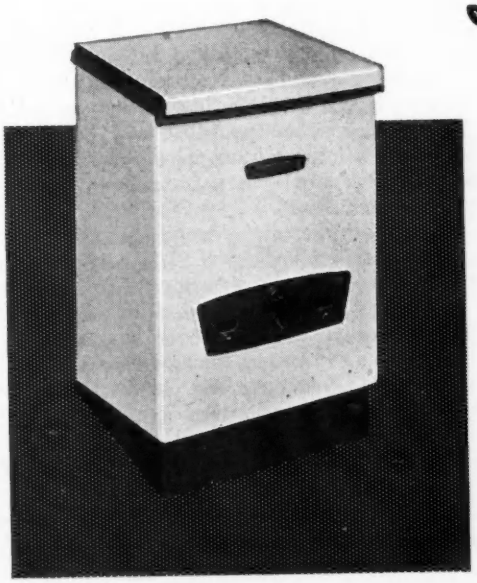
Copies of this standard may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1. Price 7s. 6d. (Postage will be charged extra to non-subscribers.)

new appliances big markets . . .



2 the MORLEY 59 Plus Gas Washer

- Hi-Lo heat selector maintains correct washing temperature.
- Safer agitation for delicate fabrics.
- Useful table-top stows neatly away.
- Easy-to-lift fold-down wringer.
- Drop-down foot rest for wringing stability.
- Concealed easy-glide castors.
- Fits under draining board.



3 the MORLEY 59 Gas Boiler

- Big capacity pan takes 7 lb. clothes, dry weight.
- Fast and economical boiling.
- Hi-Lo heat selector.
- Flash tube ignition.
- Compact and complete mobility.

MORLEY PRODUCTS (PADIHAM) LTD., VICTORIA WORKS, PADIHAM, LANCS.

From a paper to the East of Scotland Junior Gas Association.

Linking the Earlston Undertaking with Galashiels Distribution System by Moleplough

By D. R. ADAMS,
THE SCOTTISH GAS BOARD, EDINBURGH.

THE achievement of a worthwhile reduction in mainlaying costs is a subject which has exercised the author's mind for a long time. Some nine or ten years ago, following upon a study of techniques employed in Australia, for the successful use of small bore pipes in distribution systems, conveying gas at pressures considerably in excess of those normally employed in Great Britain at that time, a pilot scheme was designed with the objective of closing down a small gasworks within the area of the former South-East Division of the Scottish Gas Board. The intention was to compress the gas initially to a pressure of about 80 to 100 p.s.i.g., and to supply the receiving undertaking through pipes of 1 in. internal diameter, equipped with a suitable breakdown governor on the outlet side of a high pressure storage vessel. Other considerations however, rendered it necessary to defer, and later on to abandon, this project. Nonetheless, the idea of laying pipes of comparatively small diameter without the necessity for excavation, backfilling and the rest of the operations associated with conventional methods continued to attract, and when, in 1955, it was decided to close down the Earlston gasworks and interlink the undertaking with the Galashiels distribution system, the opportunity arose further to investigate these possibilities.

Economics should always decide the route of an interlinkage main and the shortest distance between two points is a straight line. In practice this ideal must be tempered to suit circumstances. However, the route chosen for the bulk supply main to Earlston followed this principle, notwithstanding a range of hills which rose to the 800-ft. contour line.

Major Hazard

A preliminary survey of the selected route indicated that outcrop rock would constitute a major hazard. Further investigations showed that although most of the land was utilised for hill grazing only a very thin layer of soil covered the solid rock in many places. Consultations with the farmers concerned, however, enabled a route to be determined where adequate cover could be obtained for the pipe which was only 2-in. nominal bore. Wayleave negotiations were now put in hand and right of access to the ground obtained.

Methods of laying were discussed in detail since this would be the first all steel pipe-line with welded joints, laid within the Edinburgh and South-Eastern Division. It was agreed to contact the firm of James A. Cuthbertson Ltd., engineers, Biggar, with a view to utilising the method of moleploughing which they had developed. The plant comprises:

1. A tracklaying diesel powered tractor capable of negotiating gradients of 1 in 1.

2. The moleplough itself consists of a mouldboard, a beam and a transport arrangement connected to the tractor by a drawbar. A cylindrical steel 'mole' is attached to the back of the mouldboard in such a manner that the lower edge of the 'mole' is slightly above the lower edge of the mouldboard. This ensures that the 'mole' is pulled through soil already cut by the mouldboard. The action of the machine is to cut a vertical slit in the ground to the required depth and the pipe which is securely attached to the rear of the 'mole' is fed into the aperture formed by the 'mole' behind the plough in the same operation. All operations of the outfit are carried out by the tractor driver from his seat on the tractor.

Normal Method

The method of laying normally employed is as follows:

1. A pit is excavated at approximately 100-yard intervals along the route of the pipeline. The depth of the pit approximates to the depth at which it is proposed to lay the pipe-line.

2. The pipe-line welded into 100-yard lengths and with welds suitably protected is then attached to the 'mole' behind the plough with the latter positioned above the pit.

3. The plough is lowered to the desired depth.

4. The tractor moves forward followed by the plough and the piping is pulled in behind the 'mole.' At the termination of the laying process there is a very little disturbance to the top soil, which can be consolidated by running over with the tractor tracks. An automatic depth control is incorporated in the machine which ensures that the pipe is laid at an even depth irrespective of surface irregularities.

The diameter of the 'mole' employed varies with the diameter of the pipe and for a 2½-in o.d. pipe would be approximately 4 in. in diameter. This means that the pipe is actually drawn through a hole made by the 'mole' compressing the soil, which has the effect of greatly relieveing the drag on the pipe-line. The piping which was to be used in our case consisted of 2.375-in. o.d. by 11 s.w.g., electric resistance welded steel tube in random lengths, factory coated with security glass tissue wrapping, painted internally with red lead, with ends prepared for welding.

Before this method of pipe laying could be successfully carried out certain important questions needed to

be answered, which were: (a) could the moleplough method be employed with the much more rigid steel pipe? (b) what effect would the dragging action have on the coating? (c) what would happen to the wrapping at each weld?

There were many doubts at this stage whether indeed moleploughing could be successfully employed, but it was decided to carry out some tests.

Wrapping Undisturbed

Two lengths of the tube were transported to James A. Cuthbertson's works at Biggar where they were welded together to form a reasonable test length of about 40 ft. The welded joint was double wrapped with Denso tape to enable us to observe the effect of the dragging action during moleploughing. Each end of the 40-ft. length for a distance of about 9 ft. was thoroughly ininspected with a holiday detector and all holidays marked. The pipe was then attached to the moleplough and without a pit being excavated, was pulled into and through the ground at a depth of about 2 ft. for approximately one hundred yards and then pulled back out to the surface. There was quite a rush to examine the 'Denso' wrapping over the weld. To the author's great relief it had not been disturbed apart from a very slight ruffling at the loose end. It should be stated here that we had unwittingly pulled the pipe through the ground against the lay of the Denso wrapping. The holiday detector was applied to the ends of the pipe as before and it was definitely ascertained that no further damage had occurred. This test was much more severe than would be experienced in actual laying conditions because (a) no pit had been excavated and (b) the pipe had been pulled back out of the ground. However, doubts still existed due to the much rougher subsoil which it was anticipated would be encountered crossing the hills to Earlston. A similar test of the actual site of the proposed main was arranged utilising the same length of pipe. This second test over another 100 yards without pits did not disturb the original Denso wrapping.

It was agreed that plans should go ahead based on utilising the moleplough for laying approximately 6,000 yards of the total length of 7,510 yards. The remainder of the route which was parallel to a railway track, was inaccessible to the moleplough, and here again the main would require to be laid by conventional methods.

A soil survey over the length of the route was carried out by Metal and Pipeline Endurance Ltd. From this survey it was found that apart from a section of the route near the Earlston gasworks, the soil resistivity was high. Nevertheless, it was decided that cathodic protection be applied to the complete pipe-line as it was felt that no chances should be taken.

Meanwhile, a contract for the welding had been let and serious planning of this work was in hand. It must be borne in mind that due to the speed at which the moleplough could lay the main, all the welding required had to be completed before the machinery was brought on the site.

The normal method of stringing the pipes along the route of the main with the welders following up was more or less ruled out due to the difficult terrain. It was decided that welding should be done at predetermined points along the route from whence the 100-yard lengths could be pulled into position for laying. After delivery to the selected points, the pipes were first welded into 100-ft. lengths and three 100-ft. lengths were then welded together to form a composite length. Each 100-yard length was subjected to an air test pressure of 50 p.s.i.g., and radiographical inspection of the welds was carried out by Metal and Pipeline Endurance, Ltd.

Welding operations commenced on February 4, 1958, and it was not long before some of the worst weather of the 1957-58 winter was upon us. Not only did heavy snowfalls hamper operations but gale force winds made welding a nightmare. Even under cover it was most difficult for the welders to make good welds as the high winds were causing the long lengths of pipe to vibrate to such an extent that proper fusion at the welds did not occur. The radiograph checks showed up these weaknesses and many welds had to be cut out and remade. To illustrate the severity of the trouble it will be sufficient to say that out of a batch of 36 welds made under these arduous conditions, 28 failed the test.

Quite Satisfactory

In fairness to the welders it must be said that a high proportion of the welds which were cut out appeared to be quite satisfactory until subjected to radiographical examination. The wisdom of continuing work under such conditions was being questioned and the answer came with another heavy snowfall which prevented access to the site for four days. By this time our target date for the commencement of moleploughing was looming ahead and it was decided to work every weekend in an endeavour to keep ahead.

On March 10, 1958, the moleplough arrived on the site and spirits soared. At last it was thought that the job was really getting under way. How wrong this proved to be.

As the pipes had plain ends it had been necessary to design an arrangement which could be utilised to attach them to the mole, without damage. A chuck assembly to grip round the pipe, something similar to that used in a normal joiner's hand brace, had been made by James A. Cuthbertson Ltd. This, however, proved unsuitable under working conditions and slipped off the pipe after about 50 yards had been moled in. This caused great concern, but Cuthbertson's came up with the answer. Instead of an external grip it was decided to use an internal expander. By using a small collar on the outside of the pipe it was possible to avoid ridging the pipe. This proved most satisfactory and the assembly was used during the whole of the moleploughing work.

Moleploughing of the pipe-line began on March 13, 1958, and the project was carried out in the following sequence:

1. The 100-yard lengths of pipe were dragged into their approximate positions.

2. All welded joints were wrapped with glass fibre tissue bandage as were all breaks in the original factory coating.

3. Fences, hedges and walls on the proposed line were removed and replaced by temporary fences which could be easily pulled aside to allow the pipe-laying machinery through.

4. A Dinkum digger was utilised to excavate the pits at one hundred yard intervals in front of the moleplough.

5. The pipes were ploughed in by the moleplough.

6. The tractor tracks were run over the slit in the ground surface to consolidate the soil.

7. Each 100-yard length laid was coupled to the previous one laid by a Johnson Junior Viking coupling, which avoided positional welds in the pits.

8. Bond wires were welded across the Johnson couplings to preserve electrical continuity for the cathodic protection system. These welds were made by the 'thermit' process.

9. The Johnson couplings and bond wires were wrapped with glass fibre bandage.

10. All pits were filled in and the ground consolidated.

11. Fences, hedges and walls were replaced.

It should be made clear at this juncture that two tracklaying tractors were on the site. The extra tractor served the dual purpose of (a) running over the slit in the ground surface and (b) adding additional drawbar pull if the moleplough ran into difficult soil conditions.

Moleploughing was completed by March 21, 1958. Allowing for unavoidable delays the total of 6,094 yards was laid in seven working days which is an average of approximately 887 yards per day. The time taken to actually mole in one 100-yard length, not including the time taken to couple and uncouple the 'mole,' was 3½ minutes. This gives some idea of the speed which can be obtained by this process—nearly one mile per hour. The obvious question arises—why then was the average daily yardage only 887 yards? The answer is both simple and truthful—the weather. There was still considerable snow about and ground conditions were such that the Dinkum digger had to be towed into position to excavate the pits by the moleplough tractor as its own Ferguson tractor just could not move.

It was most gratifying to see that little disturbance of the ground surface could be detected once the tractor tracks had been run over the line of the buried pipe. This was so even although each section had been 'run' with the moleplough only prior to the actual pipe-laying operation to ensure that no buried rock barred the path.

To facilitate moleploughing operations no provisions were made, at the time of laying, for syphons but all low points were marked which was simplified by the undulating ground. An excavation was made at all these points and a 2 in. by 1 in. Junior Johnson teepiece inserted in the main. Bond wires were welded across the tees and the whole covered with a protective wrapping. The branch of the tee was connected to a half-gal. syphon pot, and a standpipe from the syphon brought to the surface. In all cases the standpipes were terminated as near as possible to fence or hedge lines to avoid possible fouling by farm implements.

The remainder of the pipe-line had been welded into 100-ft. lengths and was laid by conventional methods. Joints between the lengths were made with Johnson couplings as before, with bond wires across them and the whole covered with a final protective wrapping. Syphons were also installed in the same manner as on the moleploughed section. Audco plug valves were inserted at selected points on the pipe-line.

After the two sections had been coupled together the completed pipe-line was subjected to an air test pressure of 50 p.s.i.g. The final connections at each end were of an insulating nature to ensure that current from the cathodic protection system would be confined to the steel pipe-line.

On May 15, 1958, only three and a half months after site operations began, the gas works at Earlston ceased manufacture.

In order to determine the amount of current required to give full cathodic protection to the 2-in. diameter

Gold lettered on the spine complete with instruction sheet

Bind your JOURNAL each week

No loose copies to be mislaid

We offer Journal readers a simple method of temporarily binding their copies as received week by week. No time lost searching for a particular issue; Journals removed and replaced in a few seconds. Designed to hold 13 issues, and whether completely or only partially filled the book effect is always maintained.

Price 12/6 each plus 1/6 postage

Obtainable from:

WALTER KING, Ltd., 11, Bolt Court, Fleet St., London, E.C.4

4—7/58

gay WORLD!

a full range colour finishes

NEW WORLD RADO-VECTA

Outer colours : Mandarin Red, Orchid Pink, Leaf Green, Essex Blue, Nubian, Gold. *Inner colours :* Silver, Cream.

Cheery new colours will win new sales!

Different people like different colours. Now *all* your customers can enjoy the added warmth of *colour* in the NEW WORLD RADO-VECTA. It's now available in a whole range of attractive dual colours. 13 standard combinations to choose from! Here's a brilliant magnet for extra sales. Right in line with today's trend towards more colourful homes.

Bright ads. invite!

Local papers will splash the news of NEW WORLD colours. *Your* customers will be invited to see these cheery, gay-look heaters in *your* showrooms. Be ready . . .

To clinch a sale—Display!

The RADO-VECTA is in itself an eye-catcher. Site it prominently. Seize your chance for striking point-of-sale displays. That's the proved way to turn prospects into *buyers.*

the way in building turnover...

RADIATION GROUP SALES LTD, 255 NORTH CIRCULAR ROAD, LONDON, N.W.10. WILlesden 1234

D

main, a current drain test was carried out. This involved installing a temporary cathodic protection scheme and draining different values of current until the optimum value was obtained to give full protection. The temporary groundbed was situated at Sorrowless Field mains, and consisted of several sheets of corrugated iron immersed in a stream aproximately 100 yards from the pipe-line. A cable was connected from this temporary groundbed to the positive terminal of a portable generator, the negative terminal being connected by means of a 'G' clamp to a syphon. The generator was started and run for about three hours to allow polarisation to take place.

On the first test (July 25, 1958) a current of 3.3 A. was drained from the pipe-line and pipe to soil potentials were taken at selected points using a Cambridge potentiometric voltmeter and a copper/copper sulphate half cell. The readings obtained were as follows:—

At the drain point, *i.e.*, where the connection was made, the potential was 3.9 V., and at syphons towards Earlston the potentials were 3.75, 2.8 and 3.00 V., and at Earlston gasworks the potential was 3.05 V., the total affected length under protection being approximately 2,000 yards. In the other direction, the potential at the end of the line at Gattonside was 2.3 V., a distance of approximately 6,000 yards.

On the second test on July 26, 1958, the current drained from the pipe-line was reduced to 1.5 A., and again after allowing sufficient time for polarisation the following applied potentials were obtained. At the drainage point the new potential was 2.3 V.; Earlston gasworks 2.1 V., and at Gattonside End the potential was raised to 1.7 V.

At the same time interference checks were also carried out on railway bridge crossings at Earlston. On the first bridge, *i.e.*, the one nearest to the drain point, the potential was 1.42 V., indicating that in some way or another the bridge was bonded to the pipe-line. At the second bridge, the bridge to soil potential was .5 V., indicating that the bridge was insulated from the pipe. From these figures it was calculated that a current density of .12 mA. per sq. ft. would be sufficient to afford overall protection to the line. Accordingly, a permanent installation was designed on the information gleaned from the current drain test. It was decided to use the same field for the permanent installation as for the current drain test.

A 240-V. a.c. supply is available which will be carried overhead to a pole-mounted 5-A, 24-V. transformer rectifier. From the transformer rectifier, a positive and negative d.c. feed will be connected by half-clamps to the 2-in. main, and the positive lead to be carried in a small trench underground to be connected to the groundbed by thermite welding. The groundbed will be 276 ft. in length, the nearest point of the trench being 300 ft. from the pipe. It will consist of ½ ton of 4-in. internal diameter steel pipe laid in a trench 4 ft. 3 in. deep backfilled with coke breeze.

Costs pertaining to this project are set out at foot of previous column.

When considering the foregoing costs the following points should be borne in mind:

1. This project was of an experimental nature and it is the author's belief that the experience gained could result in a considerable reduction of expenditure in similar projects in the future.

2. The atrocious weather conditions which were encountered.

3. The selected route was the worst possible for main-laying, but in many ways showed up the advantages of the moleplough.

4. The section which was laid by hand was in a very confined area close to a railway line and includes the crossing of two bridges.

Item	Moleplough cost per yard	Handlaying cost per yard
	s. d.	s. d.
Material, pipe	8 1½	8 1½
Johnson couplings	0 1	0 1
syphons	0 2	0 2
valves and tobies	0 2	0 2
Welding	1 7	1 9
Welding labour	1 5	1 7
Welding supervision	1 9	1 11
Bonding	0 2	0 2
Moleplough	1 8	—
Moleplough labour	0 6	—
Handlaying labour	—	11 4
Testing	0 3	0 3
Fences	0 1	—
Miscellaneous	0 2	0 2
Field drain repairs	0 4	—
Soil survey	0 3	0 3
Cathodic protection, (approx.)	0 2½	0 2½
Wayleave charges	1 0	1 0
Total	17 11	27 2

NEW BOOKS

Review of Benzole Technology, 1957. Published by the National Benzole and Allied Products Association.

THE regular publication of a volume such as this should be of the greatest use to many besides the petroleum technologist. It is, in fact, a bringing together of all the contemporary work coming within the field of interest of the Association. Under different sections, such as production from carbonisation processes, benzole recovery, benzole refining, properties and many others, the latest developments are referred to and a full set of references given. In fact, it would appear to the new reader that instead of a dull list of references, the author has successfully written an interesting narrative on which to hang the references almost accidentally.

The 1958 tool catalogue of Buck & Hickman Ltd., the well-known tool merchants and suppliers to all mechanical trades, continues to maintain its reputation for completeness. The specialised tools for any trade from carpenter to tinsmith or boat builder to motor mechanic can be found listed here and in the great majority of cases illustrated. The comprehensive index in the front of the catalogue is divided up into an alphabetical description section and a figure number section, so that a knowledge of either can quickly put the enquirer on to the item he is looking for. Its compact size, the pleasant maroon binding and the restrained gold lettering on the cover, might give a false impression of the contents of this useful adjunct to every ironmongers' office and to the buyer's department of every factory in Great Britain.

Impressive tests on sacks for solid fuels

ORIGINALLY introduced in the years before the war for packing 'Coalite,' the use of Palfsacks, the multi-wall paper sacks made by William Palfrey Ltd., grew enormously until wartime restrictions compelled the return of bulk deliveries. Since then, Palfsacks have been further developed, resulting in economic containers for all types of solid fuel. The following test, carried out by a leading authority before embarking on a scheme for pre-packing coke, demonstrated the way in which the sacks stood up to rough treatment under bad conditions and remained undamaged.

Designed for exposure

The Palfsack used was of 2-ply construction designed to withstand the effects of exposure to the elements. It was made of one heavy- and one lighter-ply, both of wet strength quality.

The test consisted of loading 28 lb. dry coke into the bag and subjecting it to, (a) rough handling from platform scales 7½ in. from concrete floor level, (b) tossing from man-to-man at 5 ft. centres, with one drop to the floor from 1 ft. 3 in., and (c) a drag along a floor of 4 ft. 6 in.

There was no sign of failure of either outer or inner bag.

No failure

This was followed by saturating the coke with water and thoroughly wetting the outside bag. It was then given normal handling and was dragged across the floor. Inspection afterwards detected no sign of failure.

Shortly afterwards, cold weather was experienced and the bag and contents became frozen solid. With the thaw it was possible to resort to normal handling, plus some rough jerking and dragging along a floor.

No sign of failure of either inner or outer bag was evident.

In its wet state, it was carried by the neck for 30 yards without fracture. After drying out, the bag was again loaded with 28 lb. No. 3 coke and inspection indicated that it could be used at least twice or possibly three times without failure.

This is of particular interest now that an ever-increasing proportion of the population is being housed in flats and small dwellings with virtually no provision for the storage of fuel in bulk. Solid fuel delivered in a small, easily handled and clean container is a must for the modern housewife, and it would appear that 28 lb. or 56 lb. multi-wall Palfsack is ideally suited to the purpose. —*William Palfrey Ltd., 24, City Road, London, E.C.1.*

'World's largest vacuum cleaner' delivered to National Coal Board

THE National Coal Board has recently taken delivery of the largest vacuum cleaner in the world.

This is a huge 14-ton high-power mobile unit which is touring collieries in the Midlands. It has been designed and manufactured by the British Vacuum Cleaner & Engineering Co., Ltd., which has previously built and installed fixed plant for boiler cleaning at a number of collieries.

Trade news

The equipment, with its trailer, is more than 22 ft. long and is 15 ft. high. It has been developed from a similar unit built two years ago for heavy-duty furnace cleaning at the Lackenby works of Dorman Long (Steel) Ltd. This, however, was fitted with solid wheels and intended for local movement only, whereas the National Coal Board version is somewhat larger and is actually built on to an articulated trailer. This formidable vehicle can be seen travelling in the Midlands en route to the pitheads where it is used for cleaning boiler flues and coal screening houses.

At the recent hand-over demonstration at Desford Colliery, Leicestershire, colliery engineers were most impressed by the performance of this plant which was shown to have a rate of dust removal of four tons an hour or more. In the restricted space of a boiler flue of some 42 in. dia., dust deposits often rise to half this height for the whole length of the flue, a distance of approximately 20 ft. The rate of operation of the B.V.C. mobile unit means that an operator can complete the cleaning of such a flue in about 30 minutes and a whole battery of boiler flues can be effectively dealt with in one day's work.

Taking all cost factors into account, colliery officials estimate that the plant will show a saving of approximately 80%.

Note. This company, which made the world's largest vacuum cleaner, also made the first, more than 50 years ago. Invented by the company's founder, the late Mr. H. Cecil Booth, it was presented by the company to the Science Museum, London, at the beginning of this year. —*British Vacuum Cleaner & Engineering Co., Ltd., Goblin House, Leatherhead, Surrey.*

NEW VENTURI GAS SCRUBBER

CHEMICAL Construction (G.B.) Ltd., announce that the completion of a licencing agreement now enables them to offer the Svenska-Flaktfabriken venturi scrubber in addition to their Pease-Anthony venturi and cyclonic type scrubbers.

The S-F scrubber extends the range of their equipment to cover most gas cleaning problems that can be dealt with by wet scrubbing.

Chemical Construction (G.B.) Ltd., Henrietta House, 9, Henrietta Place, London, W.1.

PAINT + HUMIDOX = RESISTANCE

THE Yorkshire Electricity Board recently completed an important six-year experiment with Humidox, the anti-humidity chemical additive for painting on damp surfaces. The makers say that the Board's report 'exceeds expectations' and is 'extremely satisfactory.'

Exposed location

Six years ago, a series of pylons and transformers, chosen for their exposed location, were painted with Humidox-treated Aspilin gloss enamel in severely inclement weather. Today, they are still in excellent condition. The gloss and colour of the finish compares favourably with similar surfaces, painted with untreated gloss enamel in the same year, but in good weather. Furthermore, the Yorkshire Electricity Board has extended the period normally allowed for repainting, and it has only been necessary to patch-prime steelwork when repainting.

Humidox was developed by the research department of Aspinalls (Paints) Ltd., to facilitate the painting of moisture-laden surfaces and to allow exterior decoration to be carried out in all weathers. The economic advantages of an effective anti-humidity paint additive to contractors and maintenance departments are clear.

Paint containing Humidox will effectively displace surface moisture by allowing the oil component to wet the damp surface in preference to the existing layer of water. Moisture is moved into the paint film from which it evaporates before the paint is oxidised.

Humidox is not a cure for wet woodwork or other saturated materials. It is intended for use on iron, steel and other surface-wet materials that are dry below the surface.—*Aspinall's (Paints) Ltd., Carleton, Skipton, Yorkshire.*

Snip Snap control

GEO. W. KING LTD., of Stevenage, Herts, has announced the Snip Snap, a new mains pushbutton control for hoists. Primarily designed for the King Mytemin and Marvex range, the Snip Snap can be applied to other types and makes of hoists, cranes and similar appliances which are wired for mains supply.

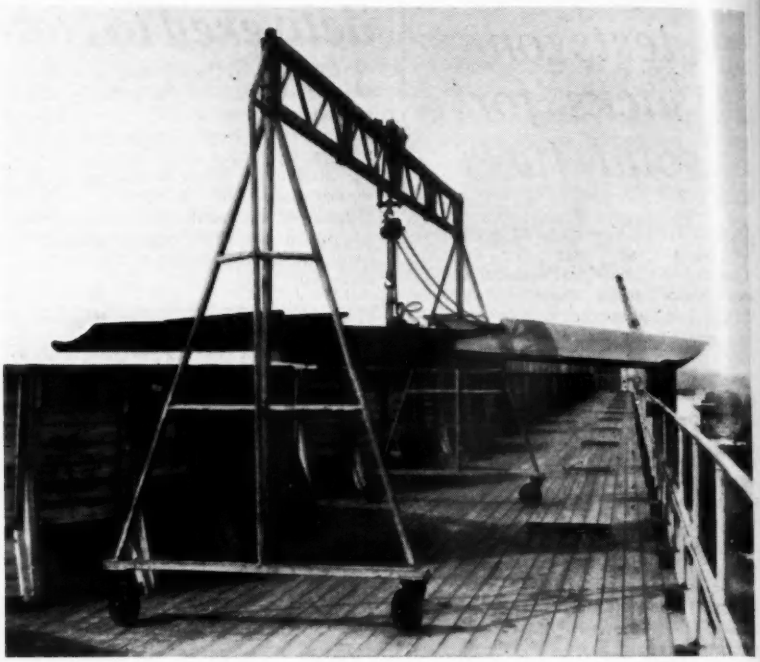
The use of the Snip Snap dispenses with the conventional type of reversing contactor, combining the function of contactor and pushbutton in one compact unit.

A MULTI-PURPOSE PORTABLE TOWER GANTRY

HEAD WRIGHTSON PROCESSES LTD., a subsidiary of Head Wrightson & Co. Ltd., have developed a portable cooling tower gantry to assist with tower maintenance.

The removal of the induced draught fan and fan drive gear box for inspection and maintenance necessitates rigging up suitable tackle which normally delays bringing the tower back into service, so to speed this operation, the Head Wrightson Com-pact gantry has been designed. An essential feature is the ability to man-handle the various components to the fan deck of the tower for assembly and this has been done by making the main beam in short sections.

Each beam section is of deep, braced dual box construction, which can be built up into a rigid beam of suitable span to clear the fan stack, with joints having a wide bearing face to eliminate any deflection under load. The tripod legs are of tubular construction, suitably braced and provided with a central rib-brace to ensure stability. The beam is coupled to the top of each leg with a wide bearing connection similar to the beam section joints. Each tripod leg is fitted with two swivelling self aligning castors, allowing the gantry to run the full length of the deck and also to rotate around the fan stack, which allows the equipment to be stowed in any suitable position on the deck. The trolley, running on the top of the beam is fitted with four rollers and with suitable hanging bar for the lifting blocks. The gantry is designed for a safe working load of 20 cwt. with a span of 24 ft.



Portable gantry in operation on a large cooling tower installation supplied to a Government department. This gantry has been developed to assist with the tower maintenance by Head Wrightson Processes Ltd.

When not in service on the cooling tower, this equipment can be used for many lifting purposes and, being portable, may be moved to various locations with the span reduced by omitting one or more sections as necessary for operation in confined positions.—*Head Wrightson & Co. Ltd., Ship House, 20, Buckingham Gate, London, S.W.1.*

Evershed produces new idea in line earth loop testing

A NEW instrument in the Megger series has been designed by Evershed & Vignoles Ltd., which involves a basically new thought on the subject of line earth loop testing, i.e, testing of circuits which will carry current to earth in the event of a fault. With this instrument the full mains potential is applied to pass a current of approximately 20 amps through a circuit consisting of the live conductor, the earth continuity conductor and the earth return path. In other words, the instrument passes the test current through the actual fault path and the indicating instrument employed may be calibrated directly in terms of the resistance of this path.

This type of test is called for in Regulation 507 of the I.E.E. Wiring Rules, but the majority of instruments designed for this purpose pass a current through a loop consisting of the neutral conductor, the earth continuity conductor and the earth return path.

In the Evershed line earth loop tester, a ballistic meter is used as, for obvious reasons, the test current must be of limited duration. The ballistic meter will, however, maintain the reading after the current pulse has declined. A synchronous motor, energised through a push button switch, is used to drive a contactor which connects a 10 ohm resistor from the live conductor to earth for a period of 5 cycles, i.e, 0.1 second. The current during this period will be of a value determined by the 10 ohm resistor plus the actual resistance of the fault loop in series with the 10 ohm resistor. *Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick, London, W.4.*

NEW ROZALEX CLEANSER

THE new Rozalex industrial cleanser is of a soft, jelly-like consistency, and is easily applied to the skin, picking up and suspending all grease and grime. No soap or other cleansing substance is required, it does not run off the hands and therefore prevents waste.

Non-gritty, it contains no abrasives which could cause mechanical and physical damage to the skin. The cleanser, equally effective in hot or cold water, has good detergent and suspending qualities, leaving no scum or deposit in the wash bowl.

Containing no free alkali to cause excessive degreasing, chafing or laceration of the skin, the cleanser is superfatted and leaves the skin smooth and supple after use, with no trace of dryness.

An important advance in industrial hygiene, the cleanser can be used in a special Rozalex dispenser which directs exactly the right amount into the palm of the hand.—*Rozalex, Ltd., 45, Cross Street, Manchester, 2.*

GOVERNORS

of all sizes and types,
both pressure and volumetric.

Peebles

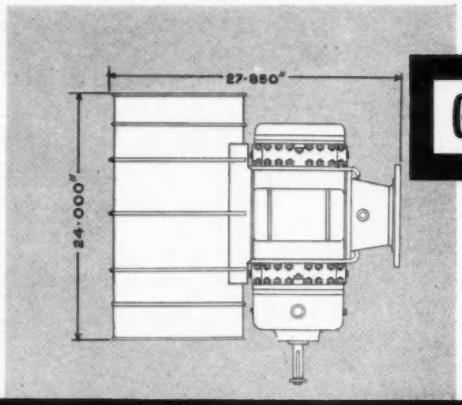
& CO. LTD.

CONTROL VALVES

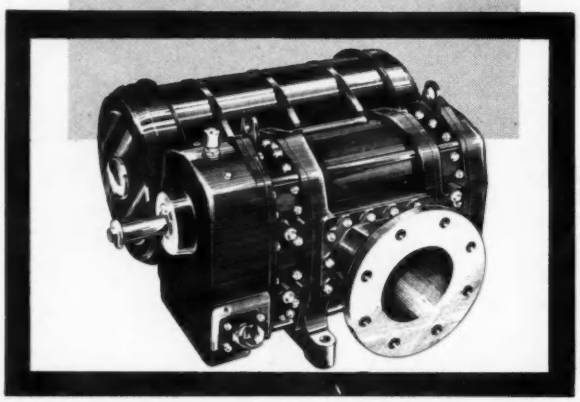
Holder Valves, Relay Valves, Cut off Valves,
Back pressure Valves, Relief Valves,
Automatic clock controllers,
Pressure switches, etc.

TAY WORKS, WEST BOWLING GREEN STREET, EDINBURGH, 6.

Telephone: LEITH 36544 & 35069, Telegrams: "TANGENT, EDINBURGH"



GODFREY INDUSTRIAL BLOWERS



★ high performance
★ small bulk
★ low weight
★ oil-free delivery

THOUSANDS of Godfrey blowers are in service throughout the world in such applications as: pneumatic conveying systems, fluid agitation, sewage aeration, fume extraction, furnace blowing, tunnel ventilation — in fact in any process requiring large flows of oil-free air at pressures up to 15 p.s.i.
Also: vacuum pumps, gas boosters, super-chargers, diaphragm pumps, relief valves, etc.

Sir George Godfrey & Partners (Ind) Limited

GODFREY

HANWORTH, MIDDLESEX
Telephone: FELtham 3291 Cables: Godfrepart, London

ASSOCIATED COMPANIES IN: MONTREAL, MELBOURNE AND JOHANNESBURG

the MARK II "CL"

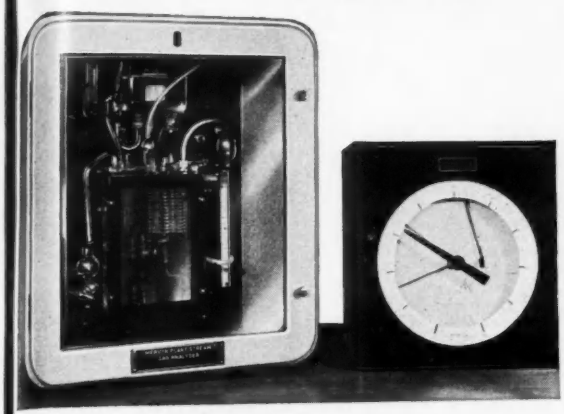
High Pressure Valve

CORROSION RESISTING STEEL DOOR •
P.T.F.E. 'FLUON' SEATING RINGS •
SIMPLE AND ROBUST IN CONSTRUCTION
POSITIVE IN OPERATION •
NO WEDGES OR SPRINGS •
SPINDLE STUFFING BOX FITTED WITH CHEVRON PACKING •
STANDARD TEST PRESSURE 100 p.s.i.g •
RAISED FACE FLANGES SUPPLIED BLANK OR DRILLED TO B.S.10 TABLES 'A' TO 'E' INCLUSIVE
INTERNAL SCREW WITH OR WITHOUT INDICATOR •

SIZES 2" TO 24" BORE
VERTICAL OR HORIZONTAL

THE BRYAN DONKIN COMPANY LTD.
CHESTERFIELD TEL: 3153 · LONDON TEL: ABBEY 1096

Automatic Gas Analysis



*PRODUCE
*ANALYSE
*RECORD
*CONTROL

–ALL AT THE SAME MOMENT

through the

MERVYN

plant stream gas analyser

MK. II

Ammonia, Oxygen, Carbon Monoxide, Carbon di-oxide, Sulphur di-oxide, Hydrogen Sulphide, etc. analysed continuously direct from the plant stream. Recorded on 24-hour or 8-day charts.
Sensitivity 0-10 ppm f.s.d. up to 0-5% f.s.d. with simple presetting and checking zero operations.
Recorder can be located remote from gas-sampling point.

RUGGED • SEALED & SHOCK PROOF • VERSATILE

DESIGNED FOR SYSTEMS ENGINEERING

Write for further information, mentioning Gas Journal to:

MERVYN INSTRUMENTS

ST. JOHN'S · WOKING · SURREY · ENGLAND

Tel: WOKING 5200/3

PB26

Gas Journal

VOL. 300 *No. 5017* *October 28, 1959*

IIITH YEAR

MANAGING DIRECTOR : Clifford A. King

EDITOR : Geoffrey W. Battison

ASSISTANT EDITOR : Colin J. Godbold

TECHNICAL EDITOR : Charles J. P. de Winton, T.D., M.A., M.Inst. Gas E., M.Inst. F.

Published by Walter King Limited,

11, Bolt Court, Fleet St., London, E.C.4

Telephone: FLEet Street 2236-7 **Telegrams:- Gasking, Fleet**

CONTENTS

EDITORIAL COMMENT

Progress Report on Westfield - - - - - - - - 183
A.G.J. Centenary - - - - - - - - - - 184

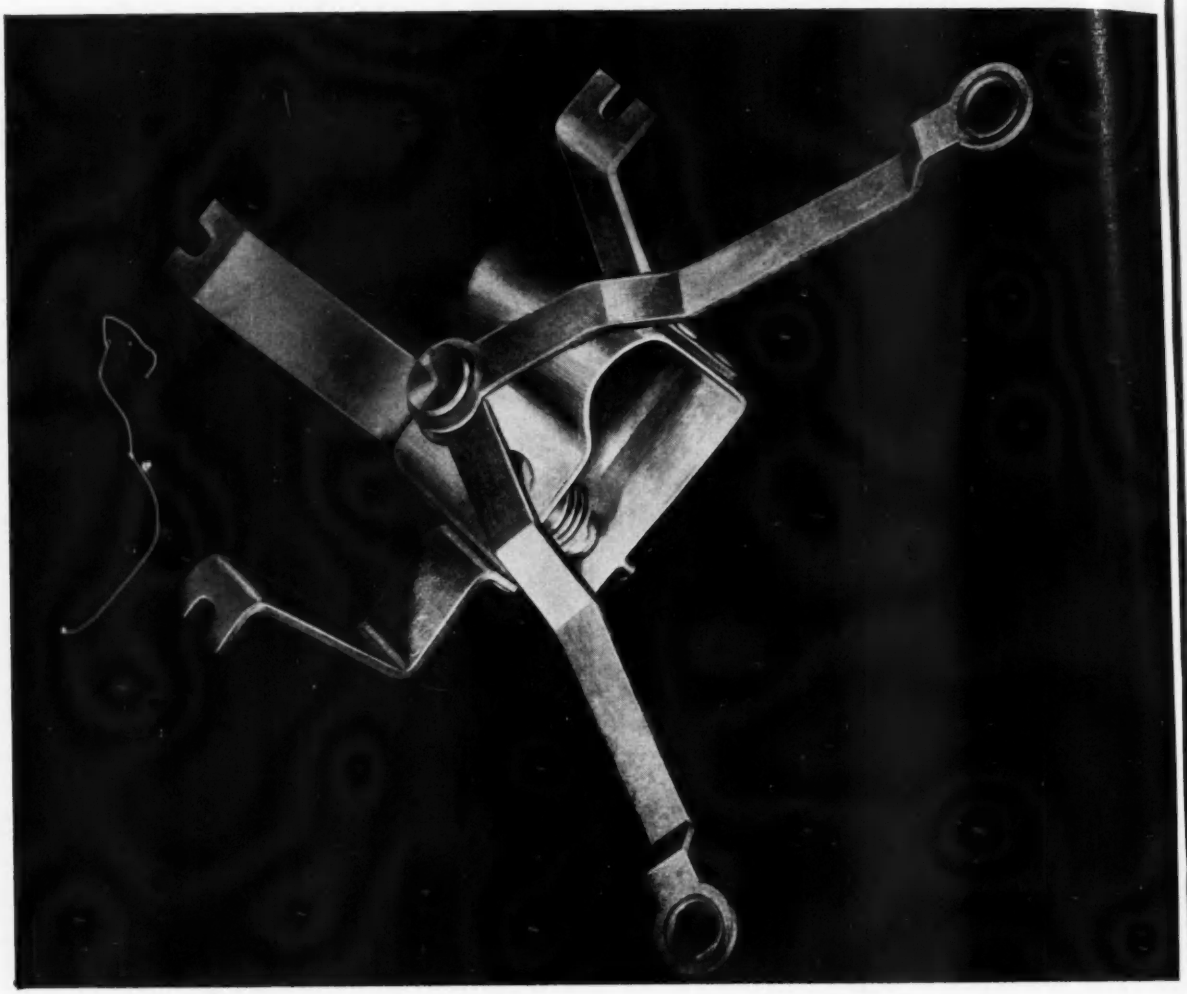
NEWS OF CURRENT EVENTS

Personal - - - - - - - - - - - - 185
Diary - - - - - - - - - - - - 185
Administration Changes Reduce North Western Groups to Eight 185
Indian Order for Power-Gas - - - - - - - - 186
Midland Juniors Visit Retford - - - - - - - 186
New E.M.G.B. Housing Centre Opened - - - - - 186
Nation-wide Kinetic Campaign - - - - - - - 186
Bomb Search Near Beckton - - - - - - - - 186
New Methods May Save Sc.G.B. £400,000 a Year - - - 187
American Gas Association Convention - - - - - 187
Cambridge Instrument Laboratories Opened - - - - 187
Lurgi Plant Makes its Debut - - - - - - - 188

TECHNICAL RECORD

A Review of Possible Economies in Gas Production. By W. J. Spiller - - - - - - - - - - - - 190
Four River Crossing Projects Using Steel Mains. By F. Bell - 194

Publishers' Notice, See Page 168, October 21, 1959



There is more in gas metering than meets the eye

This is the gearbox and crank arm assembly of a domestic meter.

The gears are precision-cut to fine tolerances.
For permanent protection against corrosion and wear,
they are enclosed in a gearbox packed with a specially selected
lubricant. The rigid crank arms are provided with
stainless steel bearings.

It is the thorough design, meticulous manufacture and
careful assembly of each component that has made Parkinson Cowan
meters so famous for long life with consistent accuracy.

PARKINSON COWAN GAS METERS

Terminal House, 52 Grosvenor Gardens, London, S.W.1. SLOane 0111

Gas Journal

VOLUME 300 No. 5017 OCTOBER 28, 1959 111th YEAR

Progress Report on Westfield

THE opportunity afforded to journalists recently by the Scottish Gas Board to inspect the site of its new plant under construction at Westfield in Fife was timely. Many interested in the future of the gas industry as well as those employed by the area boards might be forgiven if they had felt some anxiety over the slowness with which new developments in our industry were being translated into practical achievements. At Westfield, at any rate, the Scottish Board is showing the pioneering spirit for which the Scots are traditionally known, and is putting down the first Lurgi high pressure gasification plant to be built in this country.

The dwindling supplies of suitable carbonising coal have been a matter of concern to the industry for some years, and so has the increasing cost of good gas-making coal. Any process which will successfully gasify low rank coal is, therefore, to be welcomed, but to be fully successful any such new plant should be built at the colliery. In this respect, too, the Scottish Board is a pioneer.

It would seem that a deposit of low rank coal of poor quality was discovered at Westfield as the result of a survey of possible coal reserves by the National Coal Board and the Gas Board were able to see the possibilities of this source of raw material. The Lurgi process needs coal of certain characteristics, among which is that it should not cake in the gasifier, but a high ash content, such as that found in Westfield coal, is little or no disadvantage. Here then was an opportunity, not to be missed, of putting into practice new gas-making techniques recommended as feasible by our leading gas engineers.

The N.C.B. estimates the life of the Westfield deposit at 20 years at an annual rate of extraction of 1 mill. tons. Of this quantity, the Scottish Board will consume something over 300,000 per year when the plant is complete and working to capacity. Here then is another opportunity, and the Scottish Board has taken precautions to make sure of a constant supply of cheap coal over the period of the life of the deposit and over the period of amortisation of the gasifier and ancillary plants, both of 20 years, after which slightly more costly coal may be economically used. The signing of the necessary contract allows both boards to go ahead and each to exploit its own particular share of the enterprise.

The balance of the coal extracted but not used by the Gas Board, will be washed and exported from the site; this will be the only use to which the railway sidings will be put, with the possible exception of the export of by-products from the new plant. This will be the first gasworks in Great Britain to have its coal brought to it by belt conveyor.

So far only the fundamentals of the scheme had been settled and it has fallen to the designers and chief contractors, Humphreys & Glasgow, Ltd., to carry it to a practical conclusion. Here again we are impressed by the pioneering spirit of all concerned, for the task facing the contractors was one of extreme difficulty. The site was largely a peat bog; this had to be cleared before excavating machinery could be brought to effective use, and piles had to be driven down to the bed rock to carry the very heavy pieces of plant. Added to this, designing the plant to make a town gas to meet the exacting standards of British practice was another problem to be solved before work could start.

As to whether the contractors have been wholly successful in solving the second and major problem, we shall not know until the plant is commissioned towards the end of next year, but clearly every effort has been made and every opportunity taken to learn as much 'know-how' as possible. Of the Lurgi plants already in existance throughout the world, the most important to the British gas industry are at Dorsten in Germany, Morwell in Australia and Sasolburg in South Africa. Though the raw materials used in each differ from Westfield—brown coal at Morwell and probably at Dorsten too—and the object of gasification other than

purely for town gas manufacture—wholly for oil products at Sasol and partially so at Morwell—all have been inspected by the Board and the contractors.

Ancillary plant for treating the gas cannot be that used on a conventional gasworks since the operation of gas making is carried out at 25 atmospheres. This has meant that suitable washing plant of American design for absorbing carbon dioxide and some of the hydrogen sulphide has been incorporated and the Bischoff oxide purifiers for final purification have been used, neither of which systems are familiar to the gas industry.

With these problems solved, there remains the task of upgrading the gas to the declared value of 450 B.t.u. per cu.ft. by cold enrichment. This was a point which particularly interested us, since it is a matter of some importance. In the original design, a rich gas was to be made by oil hydrogenation but the process proved to be uneconomic. Instead, two other sources of high calorific value gas are to be used; one of these is the use of methane from the Valleyfield colliery within a few miles of the site, and the other is butane brought from the oil refinery at Grangemouth. The volume of gas needed for enrichment will not be quite as high as we at first thought, since the calorific value of the gas at the outlet of the purifiers will be about 410 B.t.u. per cu.ft., and the proportion of inerts low. We might point out that the use of mine methane, at least has the merit of being indigenous and avoids questions as to the wisdom of relying on imported oil or its products.

With a capacity of 30 mill. cu.ft. per day at full output, the new plant will enable more high cost works to close down, but we thought it strange that there was no provision for gas storage on the site. The new extensions being added to the grid supply system may well be able to store sufficient gas for peak or lean periods, though the natural gas well at Cousland near Edinburgh which will eventually be connected up, may prove an excellent balancer. We felt that the Board might be relying on the flexibility of the plant itself. This consists of gasifier vessels with a capacity of about 5 mill. cu.ft. each. Would the use of less than the whole plant at times other than periods of maintenance be economic?

Our general impression of this most interesting site was that it typified the industry's new-found ability to think big, and that perhaps we really were witnessing the birth of the 'new' gas industry.

A.G.J. Centenary

AS publishers to the gas industry we consider ourselves fairly venerable, but it is interesting to note that our transatlantic cousins of the *American Gas Journal* are younger by only ten years. In congratulating them on reaching their centenary we would also like to add a word of praise for the extremely interesting issue they have produced this month to celebrate the event. This embraces the 'Diary of an Industry,' a chronological history of the gas industry, the men who built it, the ideas they developed, the companies they organised, and abstracts from the pages of the journal during its century of service. The diary is lavishly illustrated by engravings of holders, meters, regulators, industrial and domestic appliances, lighting fittings, and, perhaps most amusing of all, early transport and main-laying machines. The latter includes a fearsome steam-powered, wheel-type trencher, developed in the late 1890's, which apparently simplified ditch-digging, although its massive solid metal wheels must have limited its use to dry areas. Another interesting item is a gasoline engine-powered tractor with caterpillar tracks at the back, a single metal wheel in front and a lofty, steam roller-type roof for its bowler-hatted driver. This was developed in 1908, the same year as that in which the dashing 35-h.p. touring car (looking like a superior private fire engine) in which the 'Gas Emergency Crew' of Consolidated Gas used to speed to emergency calls in New York.

A feature of the issue is a replica of the first number of the *American Gas-Light Journal*, a 16-page affair very closely resembling the early issues of our own *Journal of Gas Lighting* which the American editor describes pleasantly as 'a prosperous and admirably conducted journal.' There is a reference to the superior illuminating power of gas made from pine wood at Macon, a plea for railroad cars and carriage lamps to be lit by gas ('A meter could be placed under the driver's seat to contain a month's supply for private carriages and a week's for hacks'), and an advertisement for Manhattan coke at $2.50 per chaldron. The advertisers include a high proportion of bankers and fire insurance companies, although there is an odd collection of no fewer than six sewing machine manufacturers! Nobody could accuse the editor of failing to support his advertisers for there are various snippets testifying to the excellence of, say, Messrs. John Cook's inks which are advertised on another page. Clearly the splendid sentiments expressed on the front page, 'Advertising is the lever with which, resting on enterprise as the fulcrum, commerce moves the world,' were taken very seriously indeed.

The editorial style could be snappy enough on occasion. Referring to Waterbury, we read 'This stock was water-buried indeed, but Mr. Merriman's good management will soon raise it,' while writing of the private concern at Schenectady the journal comments: 'It is not an incorporated company, nor has it a stated capital, but is doing nevertheless a good business. Sensible men.' In general, however, the writing was a little flowery by present-day standards—'We are arranging with a gentleman of scientific attainments, practically conversant with the business, to conduct the editorial part of the *Journal*, our own occupations being quite foreign to that department, although identified with the subject as dealers in the securities it represents.' Judging by the technically sound policy of the *Journal* today they must have found him! Equally the bland statement that they did not expect to make a profit suggests that the publishers were agreeably surprised. The surprise will have worn off now, but long may the profit continue.

Personal

MR. J. A. HEPWORTH, has been appointed Chief Engineer of the North Thames Gas Board as from January 1, 1960. A Yorkshireman by birth, he was educated at West Leeds High School, graduating at Leeds University. He joined the gas industry as a junior assistant engineer at Beckton in January 1922. He subsequently served at Harrow, Nine Elms, and Southall. In 1940 Mr. Hepworth was appointed station engineer at Stratford, and in 1943 took a similar position at Kensal Green. On vesting date he became group engineer, Euston Group; while holding this appointment he was made assistant chief engineer to the Board, and in 1952, he was appointed deputy chief engineer. He was a member of the gas industry productivity team which visited America in 1952 and is senior Vice-Chairman of the London and Southern Section, I.G.E.

MR. R. H. BONE, Commercial Manager, Scottish Gas Board; MR. W. A. M. STEWART, Falkirk District Manager; and MISS PIDSLEY, President of the Women's Gas Federation, were present at the inaugural meeting of the Falkirk branch, held in the local gas showrooms. MISS ALLISON was appointed President of the branch, with MISS FISHER as Secretary. It is hoped in the near future to open branches of the Federation in Grangemouth and in Bathgate.

MR. L. E. KIRBY, former distribution superintendent at Limerick, Eire, has been appointed a Representative of the Radiation Technical Service, to take over the Scottish and Northern Gas Board areas. For the time being correspondence to Mr. Kirby should be addressed to him at Radiation Technical Department, Thimble Mill Lane, Aston, Birmingham 6. Mr. Kirby will in due course take up residence on his territory.

MISS JESSIE WALKER, who retired recently after 40 years' service at Alloa gas showrooms, was presented with a gold watch by Mr. Sydney Smith, Chairman of the Scottish Gas Board, at a ceremony held in the divisional offices at Perth.

DR. R. S. EDWARDS, Chairman of the North Eastern Gas Board, has been elected Chairman of the council of the Coal Tar Research Association, with effect from next April.

Admin. changes reduce North Western Groups to eight

THE North Western Gas Board has created a new Group to be known as the Mersey Group which will cover the areas previously administered by the Liverpool and Wirral Groups. It has also extended the area covered by its Central Lancashire Group to include the East Lancashire Group. Both changes take effect from November 1.

As a result, the Board will operate through eight instead of ten groups, and of these eight three will serve about two-thirds of all the Board's 1,813,081 customers, namely:—

	Customers
Mersey Group	450,223
Central Lancashire Group	430,226
Manchester Group ...	363,584

MR. JACK CASTLE, formerly general manager of both the Liverpool and Wirral Groups, has been appointed General Manager of the combined Mersey Group, and MR. W. B. HARRISON will remain General Manager of the Central Lancashire Group in its extended form.

The new arrangements will involve no redundancy; merely changes in administration and redeployment of specialist officers to free them as far as possible from administrative duties.

In the large Mersey Group a new Commercial Department has been set up which will deal with all sales of gas (both domestic and industrial), coke, and appliances, and the provision of services to all types of customer. MR. FRANK FISHER, formerly Group Sales and Service Officer of the Liverpool Group, has been appointed Commercial Manager in charge of this department. This change is designed to improve still further the service offered to the public.

No other basic changes in the organisation have been made, and the production, distribution and accountancy departments in both the new Mersey Group and the enlarged Central Lancashire Group will continue to operate as before.

Diary of forthcoming events

October 29.—NORTH THAMES G.C.C.: City Hall, London. Council Meeting.

October 30.—I.G.E. MIDLAND SECTION: Chesterfield. Autumn Meeting and tour of the works of Messrs. Bryan Donkin and Co. Ltd. Paper on 'Some Aspects of the Law Relating to the Gas Industry,' by W. Burnstone, Chief Solicitor of the E.M.G.B.

October 30.—JUNIOR INSTITUTION OF ENGINEERS: Pepys House, 14, Rochester Row, Westminster, S.W.1. Informal Meeting including Paper on 'Planning a Computer Job,' by M. G. Ferrand. 7 p.m.

October 30.—LONDON AND SOUTHERN JUNIORS: Annual Reception and Dance. Caxton Hall, Westminster.

November 3.—INSTITUTE OF FUEL, NORTH-EAST SECTION: King's College, Newcastle-on-Tyne. 'Atmospheric Pollution,' by D. S. Wilson. 5 p.m.

November 5. — I.G.E. NORTH OF ENGLAND SECTION: Stockton-on-Tees. General Meeting including a tour of the Power-Gas Corporation Works and a Paper on 'Developments in Town Gas Manufacture,' by Dr. G. Milner. 2 p.m.

November 5.—EAST MIDLANDS G.C.C.: Nottingham Chamber of Commerce, Smithy Row, Nottingham. Meeting at 11 a.m.

November 6. — SCOTTISH WESTERN JUNIORS: 9, George Square, Glasgow. Short Paper Evening: 'Gas Distribution,' by D. F. Balfour, and 'Coke for the Domestic Market,' by J. Hogg.

November 7. — EAST OF SCOTLAND JUNIORS: Visit to Kincardine generating station of the South of Scotland Electricity Board.

November 10.—WOMEN'S GAS FEDERATION: St. Pancras Town Hall, Euston Road, London, N.W.1. 15th Branch Conference.

November 10. — MIDLAND JUNIORS: Paper by J. Ward, Assistant Industrial Gas Officer, N.E.G.B., on 'My Impressions of Industrial Gas on the Continent.'

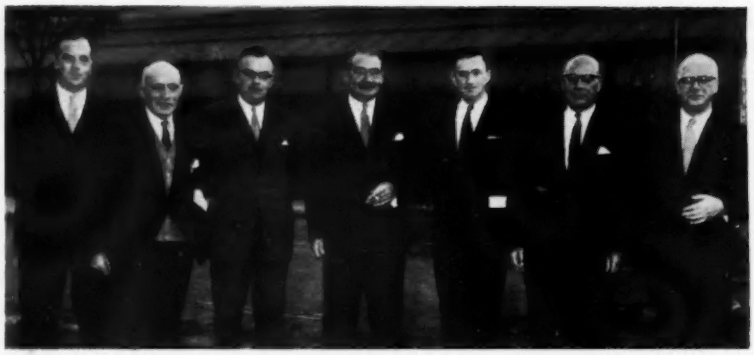
November 11.—INSTITUTION OF PLANT ENGINEERS, WESTERN BRANCH: Grand Hotel, Broad Street, Bristol. 'Developments in the Gas Industry,' by W. A. Simmonds, of the Gas Council's Midland Research Station. 7.15 p.m.

November 11.—INSTITUTE OF FUEL, YORKSHIRE SECTION: Royal Victoria Hotel, Sheffield. 'Fuel Research in the Changing Scene,' by Dr. D. T. A. Townend. 2.30 p.m.

November 11.—JOINT TECHNICAL MEETING OF THE I.G.E., THE BRITISH COKE RESEARCH ASSOCIATION AND THE COKE OVEN MANAGERS' ASSOCIATION.—Paper by G. W. Lee, Director of the British Coke Research Association, on 'The First Year at the Coke Research Centre.' 2.30 p.m.

MINISTERIAL CHANGES

MR. RICHARD WOOD has been appointed Minister of Power, in succession to Lord Mills. Mr. Wood was formerly Parliamentary Secretary to the Ministry of Labour. MR. J. C. GEORGE has been appointed Parliamentary Secretary to the Minister of Power. Mr. Wood, who is 39, is the second surviving son of Lord Halifax. He lost both legs serving in North Africa with the K.R.R.C.



Left to right: Mr. D. C. Miles, Secretary, W. J. Jenkins & Co. Ltd.; Mr. H. J. Reynolds, Secretary of the Midland Gas Association; Mr. C. Porter, President of the Midland Junior Gas Association; Mr. W. Morland Fox, Chairman and joint Managing Director, W. J. Jenkins & Co. Ltd.; Mr. R. W. Nelson, Senior vice-President of the Midland Junior Gas Association; Mr. B. Pollard, joint Managing Director; and Mr. H. Fishburne, Director, W. J. Jenkins & Co. Ltd.

Midland Juniors visit Retford

THE second visit since the war to the Retford (Nottinghamshire) works of W. J. Jenkins & Co. Ltd., by the Midland Junior Gas Association was made last week, when 50 members were welcomed by Mr. W. Morland Fox, Chairman and joint Managing Director; Mr. B. Pollard, joint Managing Director and Mr. H. Fishburne, Director. Among the members were Mr. S. C. Porter, President; Mr. R. W. Nelson, Senior vice-President and Mr. H. J. Reynolds, Secretary.

Members made an extensive tour of the works and design offices, conducted round in small groups by senior members of the technical and works staff, who described the processes and products as they passed through the different departments. Among products on view of actual interest to the Juniors were Consort and Viking screens and conveyors for a coke plant at Worcester. The visitors also saw a wide variety of material handling plant for the N.C.B. and the C.E.G.B. Also seen were some items of test plant, for guided missile propulsion units.

Mr. Porter expressed thanks on behalf of the visitors and spoke of the admirable layout of the works and of the first-class facilities for employees and staff.

NATION-WIDE KINETIC CAMPAIGN

ON November 23 a nation-wide campaign to prevent injuries caused by incorrectly lifting goods and materials in industry will begin. Although detailed statistics concerning the number of injuries sustained by workmen employing incorrect methods of lifting are not available from official sources, the campaign has been prompted by the concern expressed by industrial safety officers about the apparent incidence of injuries from this cause.

Causes of strain

The Industrial Safety Division of the Royal Society for the Prevention of Accidents has organised the campaign. Its object is to bring the interest of everybody employed in industry to bear upon the causes of strains suffered by abdominal muscles and vertebrae of the spine if care is not taken to avoid the sources of danger.

Indian order for Power-Gas

ORDERS for a total of five Wiggins' dry seal gasholders to be supplied to India have recently been received by member companies within the Power-Gas Group.

P.G. Engineering Ltd., of Stockton-on-Tees, are to supply one of the Wiggins holders, of 1,500 cu.ft. capacity, to an order by a United Kingdom firm. This holder will be manufactured in Stockton and will be shipped to site plate small.

The other four Wiggins holders are part of a contract received by the Power-Gas Corporation Ltd., Bombay, India, for the Indian Atomic Energy Establishment. These holders are being manufactured in India, special items only being supplied from the United Kingdom.

Bomb search near Beckton

A hole, believed to have been made by a 1,000 lb. bomb, has been discovered near Beckton (North Thames Gas Board) gasworks sports ground, at East Ham. A bomb disposal squad at Horsham, Sussex, has visited the site and is contemplating what action should be taken.

New E.M.G.B. housing centre opened

THE success of the two-year-old domestic two-part tariff in the Leicester and Northants Division had been remarkable, said Mr. H. B. Taylor, Divisional General Manager, speaking at the recent opening of the East Midlands Gas Board new housing centre in Leicester.

The Board was, he said, endeavouring to demonstrate, by means of the permanent exhibition, how the gas industry could help the public attain the high standard of living required, at an economical cost.

At the centre, the accent is on the new contemporary or modernised house, with an attractive decor providing the perfect background to the modern systems.

Two different systems of automatic central heating are shown in actual operation at the centre, both easy to install and inexpensive to run. The first uses a gas-fired boiler and radiators, the second heats the house by means of warm air.

Finger-thick pipes

The old bugbear of thick, unsightly pipes carrying hot water to ugly radiators has vanished and, in its place are flat, efficient, good looking modern radiators which are fed by small bore pipes no thicker than a man's finger, a silent pump forcing the water through them. This system is quicker, easier, and cheaper to install than the old one, as well as being cheaper to run. It is possible to have automatic central heating by this method plus hot water, at an average cost of only 15s. a week over the year, depending upon the heating standard required.

For new houses, warm air heating is particularly suitable. A selective unit in the centre of the house feeding several rooms direct can be installed, or a unit in the kitchen, with a drying cabinet incorporated, can take the warm air by ducts to the other rooms. Warm air central heating is a flexible system and the temperature of each room can be controlled individually. An installation of the selective type usually costs less than £100 and average winter running costs are about 12s. 6d. a week. A thermostat and clock control makes warm air heating completely automatic.

CORRECTION

A footnote to our report published on October 7 of the discussion on 'Operation of Liquid and Gastechnik Purification Plants at Cardiff' by J. Powdrill stated that the abstract of the paper had appeared in our June 10 issue. In fact, the abstract is to be found on p. 460 of the 'GAS JOURNAL' dated June 3. We apologise for this misleading error.

American Gas Association convention

CO-OPERATIVE research in the American gas industry is expected to have an annual budget of $6 mill. (approx. £2 mill.) by 1965, as part of the industry's determination to retain its strong position in 'the battle of the fuels.' Mr. J. Theodore Wolfe, retiring president of the American Gas Association, told the delegates to the association's annual convention in Chicago that 'it is imperative that research activities be increased as rapidly as effective use can be made of expanded appropriations.'

'It is equally imperative that gas appliance manufacturers raise the level of their research expenditures and that the undertakings continue the research activities they are carrying on individually,' Mr. Wolfe emphasised.

Supplement for gas

A special six-page supplement dealing with gas appliances and flues in tall buildings appeared in a recent copy of the *Architects Journal*.

New methods may save Sc.G.B. £400,000 a year

MAINLAYING DOUBLED; EARNINGS UP

IMPROVED methods and techniques, evolved to help in the drive for more efficient working, will, it is claimed, save the Scottish Gas Board £400,000 a year.

Based on new methods developed successfully in the Glasgow and Edinburgh areas, the scheme is now being extended to the rest of Scotland. It has been devised by Personnel Administration, Ltd., which has investigated methods of applying cost-reducing techniques to the industry.

Since the new techniques were introduced in Edinburgh and Glasgow, the speed at which gas mains have been laid has been more than doubled; employees earnings have risen by 18% and direct labour costs have dropped by 42%. Meter reading has also improved in speed and accuracy.

Mr. Alan Beaton, an official of the firm, explained: 'In both the laying of gas mains, and meter readings, a payment-by-results scheme is introduced. It gives the men more incentive because they can earn more money. With meter readings, a mobile van is used with a squad of men, so that they can mass attack an area. The van is used as a 'bank' so that the men needn't waste time going to a bank with money collected.

'As for the laying of gas mains, it is a question of getting the men and the material to the right spot at the right time, deploying the men on the various jobs correctly, and using mechanical aids more extensively.'

Mobile units

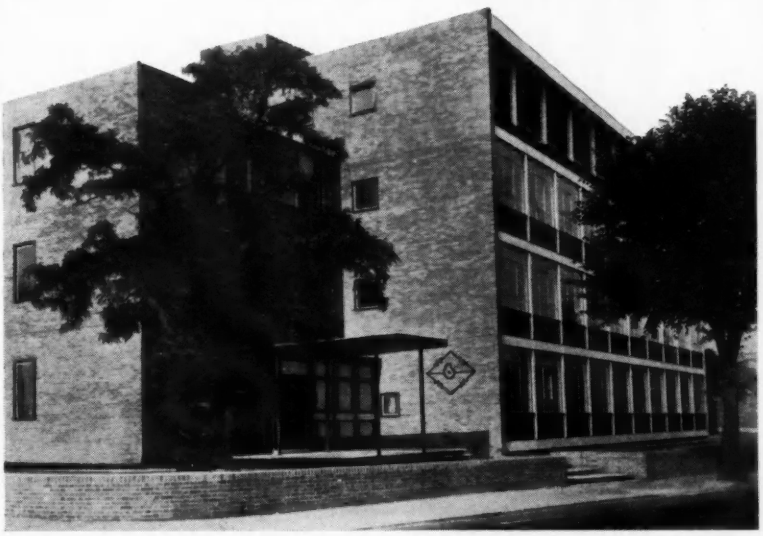
One of the new methods which has proved of outstanding value in coping with repairs is the employment of two-way radio-equipped mobile units. The main service centre in Glasgow is the headquarters from which the operators of five fitting depots and of several mobile workshops can be directed with maximum speed and efficiency, through a central telephone and radio controlled bureau. A similar system has been operating in Edinburgh and will now be extended to other parts of Scotland.

In Aberdeen, new administrative offices and a new service centre have been opened, while two new mobile showrooms are now operating in the central highlands and the South-East of Scotland.

Training employees

The introduction of radio control will quicken all branches of work. The average time taken to attend emergency calls has been cut from 8¼ hours to 45 minutes, the term emergency covering fire, accidents, escapes, poor pressure or no gas at all. Urgent calls can be answered in five minutes.

An important part of the scheme will be the training of Board employees by Personnel Administration Ltd. Gas Board staff will work with the efficiency experts, the aim being the more prompt provision of new services, better maintenance, and more rapid attention to complaints.



New Cambridge instrument laboratories

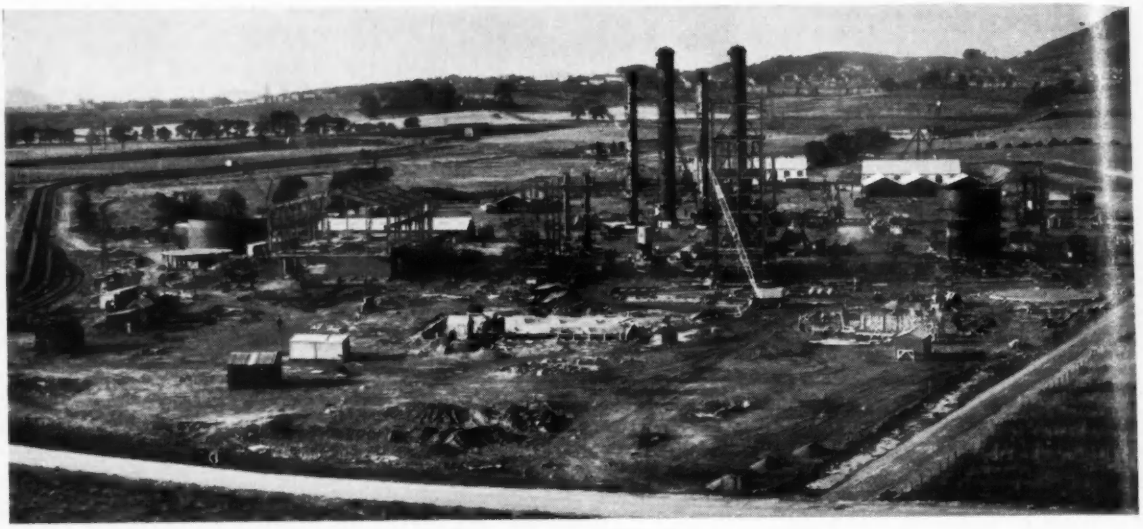
THE new research laboratories of the Cambridge Instrument Co. Ltd., at Chesterton Road, Cambridge, opened recently by Lord Adrian, O.M., F.R.S., are the outcome of an enlightened research and development policy that began nearly 80 years ago.

Starting with a small workshop and a staff of seven in 1881, the company has steadily grown in size and stature, until today it has become one of Britain's foremost instrument manufacturers, with three factories in the U.K., associated companies in the U.S.A. and Australia, and accredited agents and dealers in over 30 different countries.

The new laboratories, which consist primarily of a three-storeyed entrance block and four-storeyed laboratory block sited adjacent to the Cambridge factory, are an excellent example of co-operation between the scientist, the architect and the builder. Construction commenced in September, 1958, and the building contract was completed in just under a year.

Glasgow's first smoke control area

GLASGOW'S first smoke control area, covering 201 acres of the city centre, came into effect at midnight on October 15. Now 244 houses and 3,800 industrial premises in the area must burn smokeless fuels.



LURGI PLANT MAKES ITS DEBUT

THE recent Press visit to Westfield, organised by the Scottish Gas Board in conjunction with the Press and Publicity Department of the Gas Council, has enabled journalists to see first hand the new developments now taking place to supply gas in quantity at the lowest possible cost to Scotland's central industrial belt.

'The first appearance of the "new" gas industry in Great Britain' may fairly describe the impression of anyone visiting for the first time the new Lurgi plant now under construction at Westfield, Fife.

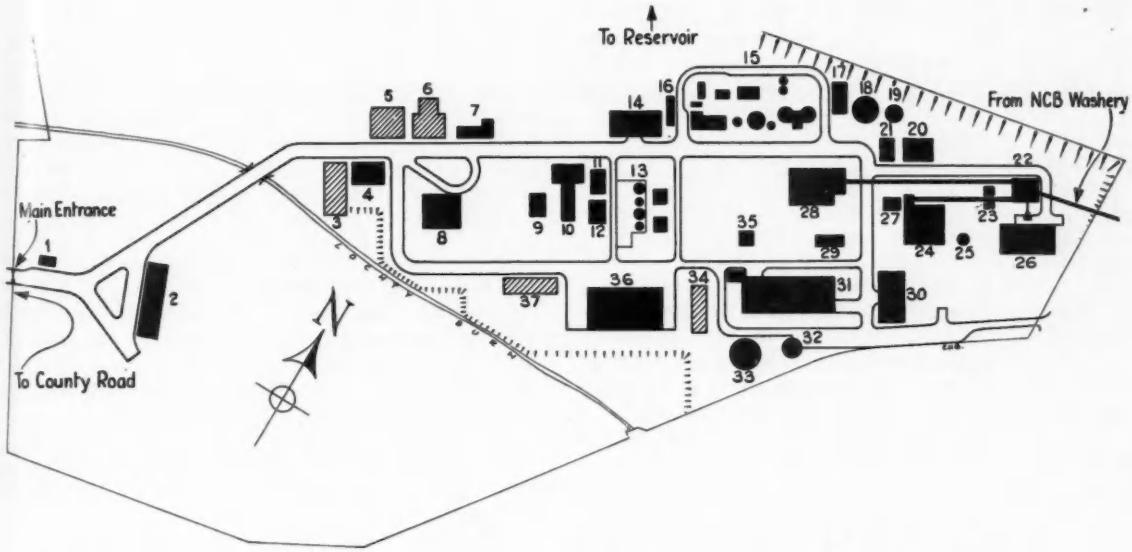
Humphreys & Glasgow Ltd., the main contractors, in conjunction with the Power-Gas Corporation Ltd., are responsible for its design and construction.

The works is being laid out on a 43-acre site, hitherto largely peat bog on which extensive civil engineering work has been necessary.

The underlying principle of the Lurgi process is the gasification of a low rank coal by oxygen and steam under a pressure of 25 atmospheres at a temperature of 700°C. The gas so produced at Westfield will be cooled, washed partially free of H_2S and

◀ *Illustrated on left are four 10-ft. diameter towers of the Benfield plant for washing CO_2 and part of the H_2S from gas. Two are 110 ft. high; two 95 ft.*

On right (opposite page) workmen are pictured fitting alloy grids into a tower while it is still lying on the ground. ▶



1 Gate House & Weighbridge
2 Administration Block
3 Pipe Fabrication Shop
4 Main Canteen & Ablutions
5 Temporary Covered Stores
6 " " Canteen
7 Fire Station-First Aid-Garages
8 Butane & Enrichment Plant
9 Gas Drying Plant
10 Final Purification
11 Switch House
12 Control Room
13 Benfield Plant Area
14 Sub-Station 'A'
15 By-Products Area
16 " " " Switch House
17 Effluent Lagoon
18 Lock Gas Holder
19 Effluent Storage Tank
20 Cooling Towers
21 Cooling Tower Switch House
22 Screening House
23 Handling Plant Switch House
24 Boiler House
25 Chimney
26 Waste Gas Disposal Plant
27 Stand-by Diesel Alternator
28 Lurgi House
29 " Aftercoolers
30 Sub-Station 'B'
31 Air Separation Plant
32 Oxygen Holder
33 Nitrogen Holder
34 Temporary Tool Store
35 Benzole Recovery-Absorbers
36 Maintainance Workshop
37 Site Office

completely free of CO_2 by potassium carbonate solution in the Benfield tower plant, and finally purified in a Bischoff under-pressure oxide purifier.

The resulting gas at a c.v. of 410 B.t.u. per cu.ft. will undergo cold enrichment with either methane drained from the coal mines at Valleyfield nearby or by butane brought from the refinery at Grangemouth.

Unwashed coal from the adjacent opencast colliery will be brought by belt conveyor to a coal crushing grading plant which will separate it into two main fractions, 1¼ in. to ⅜ in. and ⅜ in. to zero.

The former will be taken by belt conveyor to the Lurgi gasifiers and the latter will be used for steam raising in the Babcock & Wilcox Igna fluid bed type of boiler plant. Any gas trapped above or below the Lurgi gasifier reaction chambers, caused by charging coal or discharging ash, will be collected and burned under the boilers. All ash residue will be returned to the colliery.

By-products produced will include crude benzole, concentrated ammonia and tar. Oxygen for the process will be distilled from the air by a Tonnox plant supplied by British Oxygen Linde Ltd. There will be sufficient storage of liquid oxygen to allow gasification to procede undistributed if the plant has to shut down.

The first stage of the plant, with a gas-making capacity of 15 mill. cu.ft. per day, should be commissioned by the autumn of next year.

The total amount of coal consumed when the whole plant making 30 mill. cu.ft. per day is complete will be approximately 1,000 tons per day.

With the production plant, has been planned a big gas distribution scheme, which is now under construction; by means of it, gas from Westfield will be taken both northward to Perth and Dundee and southward to Coatbridge taking in Stirling and Alloa on the way. Eventually, extensions from Coatbridge will take gas to Kilmarnock and Ayr and eastwards to Edinburgh, Cousland for underground storage and Galashiels.

The total cost of the project will be some £6.6 mill. for the production plant, but including the distribution work about £8.5 mill.

From the Presidential Address to the Eastern Junior Gas Association, September 19.

A Review of Possible Economies in Gas Production

By W. J. SPILLER, Assoc.M.Inst.Gas E., A.Inst.F.

AT the end of the last war the gas industry embarked on considerable reconstruction in an attempt to overtake the arrears of development in the war years. At that time there was little indication of the trend of price increase in coal for gas making, and in consequence many new carbonising plants were laid down involving high capital expenditure.

It is doubtful whether the cost of coal for gas manufacture can be much less than 130s. per ton delivered in districts remote from the coalfields. Furthermore, the thermal yield will not be above 78 therms per ton when producing gas of 500 B.t.u. per cu.ft. at the outlet of purifiers. Table 1 shows the effects of variations in producer fuel consumption on the nett cost of coal for gas manufacture.

The following assumptions have been made: (a) The cost of coal at 130s. per ton delivered, (b) the value of tar and tar products at 1.70d. per therm, (c) a total yield of coke and breeze of 13.6 cwt., including 2.50 cwt. of breeze, per ton of coal, (d) the value of coke leaving retort house at 142s. per ton, (e) the value of breeze leaving retort house at 71s. per ton, and (f) a gaseous yield of 78 therms at 500 B.t.u. per cu.ft.

However, continuous vertical retort plants of 25 years or older are not provided with as efficient insulation and secondary air preheating as modern plants, so in consequence it may not be practicable to reduce fuel consumption below 3.8 lb. per therm. With more recent installations it is possible to achieve producer fuel consumption figures as low as 2.9 lb. per therm.

Reducing Wastage

The design of step grate producers has changed little in the past 30 years, and in general they can be operated for very long periods at high efficiency. As with most plants on gasworks, the training of operators must be adequate and supervision regular if high efficiency is to be maintained; this is specially important since, if a lb. of fuel costing ¾d. per lb. is wasted every hour for one year this amounts to £27. Although not a large sum in itself, it serves to illustrate the importance of efforts in reducing wastage of fuel in producers. Fuel usage in producers may be reduced:—

1. Careful instruction of attendants in the current method of cleaning the fire to avoid excessive unburnt coke being withdrawn with the ashes.
2. Maintaining the producer gas pressure at the correct level at all times.
3. Charging the producers at the correct time.
4. Ensuring that steam injector nozzles are correctly aligned in the venturi throat and the throats maintained clean.
5. Maintaining cleaning doors, charging lids and brickwork in good condition so that there is the minimum of leakage of steam/air mixture or producer gas.
4. Operating the producer battery at its designed rating; overloading or underloading a producer may increase fuel consumption for a particular coal throughput on the retort bench.

Coal Throughputs

Since producer fuel consumption depends on the coal throughput on the retort installation, it is of importance to maintain coal throughputs on the retort section of the plant continuously at their designed rating. With integrated working there is a reduction in the standing of retorts at week-ends due to reduced demand for gas and often, by re-arrangement of the retort scurfing programme, it is possible to avoid standing retorts even when there is no integrated working. Reports should be returned to work immediately after scurfing, since standing after scurfing is both wasteful in producer fuel and in gas making capacity.

A reduction in producer fuel used per therm of coal gas made from 3.6 lb. to 3.2 lb. would represent a saving of 13.5 tons of producer fuel per 1,000 tons carbonised, equivalent to .3d. per therm increase in revenue from coke and breeze.

More than half the cost of coal used for gas making is recovered from the sales of coke and breeze. With the considerable demand for No. 3 size coke, the necessity for cutting and also to provide all sized coke with

TABLE 1

Effect of Producer Fuel Consumption on Nett Cost of Coal

	2·8	2·9	3·0	3·1	3·2	3·3	3·4	3·5	3·6	3·7	3·8
Cost of coal D/D d/therm	20·00	20·00	20·00	20·00	20·00	20·00	20·00	20·00	20·00	20·00	20·00
CREDIT FOR											
Tar and tar products d/therm	1·70	1·70	1·70	1·70	1·70	1·70	1·70	1·70	1·70	1·70	1·70
Coke and breeze ex R.H. d/therm ..	11·37	11·29	11·21	11·13	11·05	10·97	10·89	10·81	10·73	10·65	10·57
Total credit d/therm	13·07	12·99	12·91	12·83	12·75	12·67	12·59	12·51	12·43	12·35	12·27
Nett cost of coal d/therm	6·93	7·01	7·09	7·17	7·25	7·33	7·41	7·49	7·57	7·65	7·73

a minimum of smalls below $\frac{5}{8}$-in., the amount of breeze produced per ton of coal carbonised is steadily rising. For each .1 cwt. per ton increase in breeze production the total value of coke and breeze falls by .04d. per therm. To ensure disposal of all breeze made, it may be necessary to produce a larger size of breeze than was necessary in the past. Breeze production rates per ton of coal may, therefore, have risen partly for this reason and partly because of the large amount of coke cutting now necessary.

Considerable efforts have been made to find markets for a breeze which does not include some part of the $\frac{1}{2}$-in. sized coke in the mixture. Modification to the lower size limits of No. 2 coke may also result in an increase in the normal production rate of No. 3 coke, which will reduce the need for cutting. In this way it may be possible to reduce gross breeze production to a maximum of 2.5 cwt. per ton and so increase the availability of the coke for sale.

Coke Uniformity

It would appear to be generally accepted that Nos. 1, 2 and 3 cokes should contain not more than 8% moisture. Experience shows, however, that when efforts are made to maintain the moisture content of No. 3 coke at a maximum of 8%, No. 1 and No. 2 coke will contain about 4% and 6% moisture respectively. To increase the moisture content of the larger sizes is difficult without producing excessive moisture in some batches for delivery. Uniformity in coke quality is of the greatest importance for continued coke sales, and it is up to all of us on the manufacturing side to ensure that this has been done.

Regular moisture contents of say 7% in No. 1 and No. 2 sizes as compared with 4% and 6% quoted above would increase the revenue from coke and breeze per ton of coal by over 7d., equivalent to about .1d. per therm of coal gas made. The combined effect of reduction in producer fuel consumption and excessive moisture content of the larger sizes of coke, could increase the revenue from coke and breeze by .4d. per therm and would reduce manufacturing costs by the same amount.

Integration has made possible the shutting down of numbers of small works, the gas being supplied from the larger works in the system operating at higher load factors. This has made possible a reduction in the total labour force required for all operations per therm of gas sold. In the Eastern Gas Board's area the therms of gas sold per annum per manual employee engaged on the manufacturing stations has increased from 39,000[1] in 1951 to 50,000 in 1958, an increase of 28½%. The corresponding figures for the total number employed are 13,700 in 1951 and 15,700 in 1958, an increase of 14.6%. For the same period sales of gas have increased by 11.5%. New carbonising plant and other forms of gas-making plant have clearly assisted in reducing the labour required for the manufacturing process.

Modern gas-making units, whether from coal or oil, have been developed to reduce operating labour costs to a minimum. In practice the operating labour costs will be dependant to some degree on the load factor at which the plant can be worked; those operating at high load factor, making possible reduced labour charges. Since coal carbonising plants invariably operate at higher load factor than other forms of gas making plant, comparisons between one type of plant and the other are not practicable.

A nominal 3 mill. cu.ft. per day capacity continuous vertical retort installation at maximum load factor will produce an average of 4.9 mill. therms per annum allowing for scurfing and cold resetting on a seven-year cycle. The current annual charges for operating labour and supervision allowing for holiday, National Insurance, pension costs and welfare will amount to £14,200 equivalent to .7d. per therm. If this plant were increased to 6 mill. cu.ft. per day nominal capacity, and operating at maximum load factor, it would produce 9.8 mill. therms per annum allowing for scurfing and cold resetting on a seven-year cycle. The current annual charges for operating labour and supervision on a similar basis will amount to £17,900, equivalent to .45d. per therm. Little can be done to reduce operating labour costs on this type of gas-making unit other than to work at the highest practicable load factor.

The introduction of controlled retort rodding of continuous vertical retorts, as detailed by Mr. S. K. Hawthorn[2] would reduce labour charges on continuous vertical retort plants of over 3 mill. cu.ft. per day capacity providing the control system did not incur equal expenditure on labour to maintain the system in continuous operation.

The expenditure on repair and maintenance of gas manufacturing plant is dependent upon a number of factors, as follows:—

(a) The age of the plant.
(b) Whether the maintenance is carried out to a programme as opposed to breakdown maintenance.
(c) The layout of the plant with regard to materials handling.
(d) Whether the plant is extensively electrified.
(e) The availability and quality of the maintenance staff.

Cost per Therm

Table 2 gives a summary of the maintenance charges for the Board's area from 1950 to 1958,[1] which shows that the cost per therm for repairs and maintenance of plant and buildings required for gas manufacture varies little over this eight-year period, during which there has been, approximately, a 22% volumetric increase in coal gas production plant and a 57% volumetric increase in c.w.g. production plant.

In spite of the large increase in c.w.g. production plant the thermal production of c.w.g. has decreased, that for 1957-58 being just over 60% of the thermal production for 1950-51. Thus the load factor on the c.w.g. plants is falling. With plants required for peak load production maintenance must be carried out and maintenance charges for such plant will rise in terms of pence per therm of gas made.

The thermal production of coal gas for 1957-58 increased by nearly 22% over 1950-51, so the increased coal gas plant installed contributed to pegging maintenance charges on gas production plant and buildings at a fairly stable figure. The effect of new carbonising plant installations will, therefore, be to reduce,or at least

TABLE 2

Comparison of Repairs and Maintenance Cost for the eight years from April 1, 1950—March 31, 1958.

	1950/51	1951/52	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58
Total Gas Made—Therms 1,000's Therms	137,588	140,072	142,442	145,055	153,332	153,360	150,470	154,228
Coal Gas Made —Therms 1,000's Therms	110,743	119,206	121,330	121,316	131,372	128,223	133,727	134,867
C.W. Gas Made —Therms 1,000's Therms	26,845	20,866	21,112	22,766	20,771	23,869	15,321	16,300
Repairs and Maintenance of Buildings and Plant Gas Manufacture pence/therms	1·228	1·283	1·248	1·250	1·184	1·245	1·357	1·263
Repairs and Maintenance of Coke and Breeze Plant	0·0753	0·074	0·117	0·106	0·127	0·145	0·166	0·176
Repairs and Maintenance on other by-products plant	0·035	0·033	0·042	0·056	0·066	0·074	0·074	0·095
Nett Coke make/ton of Coal cwts ..	9·24	9·28	9·28	9·24	9·21	9·18	9·10	9·04
Nett Breeze make/ton of Coal cwts ..	2·04	1·88	1·92	1·88	2·00	2·05	2·00	2·12
Nett Total Coke/Breeze make/ton cwts	11·28	11·16	11·20	11·12	11·21	11·23	11·10	11·16

stabilise maintenance charges on gas production buildings and plant.

Maintenance charges on coke and breeze plant have more than doubled in the eight-year period, and currently cost more than $\frac{1}{8}$d. per therm of total gas made. Two factors seem to be influencing the rise in coke plant maintenance charges; (a) the need to produce coke for sale of improved size classification and in consequence more attention is necessary to maintaining screen plates at the correct aperture size and, (b) the demand for No. 3 size coke incurring heavy wear and tear on coke cutting plant.

A maintenance charge for gas manufacturing plant and buildings of 1.2d. per therm of total gas made and for coke grading plant of .14d. per therm of coal gas made would appear to be minimum charges. There are works which can safely operate below these figures, but any operating above these figures present scope for the enthusiastic 'Junior' to investigate ways and means of reducing the expenditure to these figures.

Loss through Accidents

In spite of improved working conditions and the considerable attention focused on safety there is a continual rise in time lost by employees through sickness and accidents at work. I feel that each one of us should increase our efforts to reduce the spread of infection during epidemics and take stock of our works and other sections to ensure that the maximum precautions are taken to provide all employees with safe working conditions at all times.

With modern continuous carbonising plant it is possible to generate approximately 780 lb. steam at 200 p.s.i.g. and 600°F. final temperature per ton of coal carbonised from heat surplus to carbonising requirements. With older plants this steam production rate may be nearer 820 lb. per ton of coal carbonised. If this steam was utilised in a pass out turbine driving an alternator operating in parallel with the electricity board's network, and allowing for approximately 400 lb. of low pressure steam for works process per ton of coal, there would be approximately 32 kWh. generated per ton of coal carbonised. The electric energy requirements would amount to approximately 18 kWh. per ton giving a surplus for export to the electricity board's network of 14 kWh. per ton.

The cost of purchasing electricity from an electricity board would amount to approximately 30d. per ton of coal carbonised, whereas the cost of privately generating in parallel with the electricity board's network would cost about 28d. per ton including capital and interest charges on the turbo-alternator and ancillary equipment, assuming that surplus electric energy is purchased by the electricity board at .5d. per unit.

A works requiring boilers fired on coke breeze for three shifts operation would cost £3,500 for operating labour and repairs annually. By electrification of existing steam drives, and operating gas compressing plant by diesel engines it may well be possible to cease operation of the fuel fired boiler units.

With coke breeze at 45s. per ton the fuel cost to produce 1,000 lb. steam would be about 3s. 4d. The total cost per annum for operating labour, maintenance and fuel would vary from £5,000 to £18,000 when producing from 1,000 lb. steam per hour to 10,000 lb. steam per hour.

The elimination of solid fuel fired boilers and the operation of a turbo-alternator set could save from £5,500 to £18,500 per annum for power, equivalent to .27 to .90d. per therm. Whether electric energy is purchased or privately generated it is of a fundamental importance to reduce idle running time on machinery to a minimum.

Electrolysis of Water

In some districts there may be difficulties in arranging for parallel operation with the electricity board's network, in such cases it may be worth considering using the surplus electric energy for the electrolysis of water in a Knowles or other type cell for the production of hydrogen and oxygen. From each kWh. of surplus electric energy it would be possible to produce about 7 cu.ft. of hydrogen and 3.4 cu.ft. of oxygen equivalent to 84 cu.ft. of hydrogen and 42 cu.ft. of oxygen per ton of coal carbonised.

The oxygen so produced would very nearly meet requirements for revivification *in situ* on dry purification plant and would reduce the proportion of inert gases in

the purified gas and enable increased steaming rates in the carbonising plant. The hydrogen produced could be added to the purified gas.

The gross effect of using pure oxygen for revivification *in situ* increased steaming of the retorts and hydrogen admixture would be to raise the thermal yield from 78 to 83.4 therms per ton of coal carbonised. The additional steaming of the retorts would reduce the coke yield by .27 cwt. per ton of coal, equivalent to 3.6 therms. The net effect would be to raise the thermal yield from 78 to 79.8 therms per ton and reduce the nett cost of coal by 3%.

The cost of hydrogen sulphide removal with iron oxide in deep vessels amounts to .35d. to .45d. per therm. With the decline in demand for spent oxide as a source of sulphur the nett value of spent oxide is very small when taking into account the cost of breaking to a size acceptable to the acid works. The availability of natural gas at Lacq in South West France[3] containing large quantities of hydrogen sulphide will make France the second largest producer of sulphur in the world. By 1964 there may well be a world surplus of sulphur[4] and it will be increasingly difficult to dispose of spent oxide.

Reducing Sulphur in Gas

The effect of increased gas making by non-traditional methods will no doubt help keep the production of sulphur from gasworks at about the current level. The reduction of organic sulphur compounds in town gas down to 5 grains per 100 cu.ft. is an absolute necessity if gas sales are to be expanded in the domestic field for space and water heating. If total organic sulphur compounds are of the order of 25 grains per 100 cu.ft., reduction to 5 grains would produce an additional 30 lb. of sulphur per mill. cu.ft. of gas produced. The probable cost of removal of organic sulphur compounds is about .6d. per therm[5]. With the additional sulphur to be recovered at gasworks and the availability of high purity sulphur from Lacq and the oil industry, the forward position for the disposal of the very impure form of sulphur produced on gasworks is likely to be increasingly difficult.

The use of gas at the works is dependant largely on the arrangement of the works. Using gas for space heating on the works can be costly unless there is no surplus low pressure exhaust steam available. Gas consumed at the works at one therm per 900 therms produced I consider reasonable, and I feel it is a good idea to circularise regularly all foremen and plant attendants with details of the gas consumed in the various sections of the works.

With the raising of standards of facilities for personal hygiene at works there is a tendency for town water consumption to rise, and it is usual for the water consumed for this purpose to be about 25 gal. per ton of coal carbonised. If the works consumption of town water for domestic purposes is much above this figure, it is time to investigate where the excess consumption is occurring. The introduction of non-concussive type cocks on wash basins and lift and turn waste fittings can assist in reducing water wastage both hot and cold.

To expand the application of our product its price must be reduced and the economies in the cost of production made to date would not appear to be sufficient. There is little doubt that the industry must use cheaper raw materials for gas production and to concentrate gas manufacture in large units to reduce overheads and operating costs.

The pit head price differential for coal for carbonisation and steam raising is currently about 25s. per ton. The trend is for this price differential to increase, and it has been established by competent authority that supplies of traditional carbonisation coal are becoming more difficult to mine. On the other hand steam raising coals are available in the Midlands in deep seams and more easily adapted to modern methods of coal winning, thus it is possible that steam raising coals will be cheaper to mine than gas making coals.

There is currently a large surplus of small low rank coal and the surplus is likely to increase year by year, so it is probable that the differential price between carbonisation coal and low rank small coal will increase. The majority of plants available for the gasification of low rank coal produce a gas of calorific value not much in excess of 300 B.t.u. per cu.ft. and are thus not suitable for centralised gas manufacture. The processes under development by the Gas Council involving (a) hydrogenation of low rank coal and (b) the production of oil from coal would appear to meet the basic requirements for gas production for the following reasons:

1. The finished gas will be low in sulphur and carbon monoxide and of calorific value of the order of 500 B.t.u. per cu.ft.
2. The processes are suitable for large scale production.
3. Gas will be produced under pressure which will be of value for long distance transmission.

Let us hope these processes will be developed quickly so that our main product price will attract more and more customers to use a fuel which is clean, adaptable and produced at high efficiency largely from the nation's only indigenous raw fuel.

REFERENCES

[1] Eastern Gas Board—Report and Accounts—H.M.S.O.
[2] Eliminating Unnecessary Rodding on Continuous Vertical Retorts—S. K. Hawthorn, *Gas Times*, April, 1958.
[3] Putting to Work the Natural Gas Deposits at Lacq. J. Fouchier and M. Vicart. I.G.E. Publication 543.
[4] Lacq: Its Problems and Potentialities. Andre Blanchard. *J. Inst. of Fuel*, 1958 31(212), 397.
[5] Action, Reactions and Side Reactions of Catalytic Sulphur Removal. W. Wedgwood—I.G.E. Publication 525.

New Coke Standard

FROM the British Standards Institution comes a new standard which lays down quality requirements for household coke used in open fires. The new standard is B.S3.142, Part 1. It is intended to prepare further specifications dealing with (i) smokeless fuels for closed domestic appliances, and (ii) specially reactive smokeless fuels. Publication of this group of standards is in accordance with a recommendation of the Beaver Committee on Air Pollution.

Copies of B.S.3142, Part 1, can be obtained from the Sales Branch, British Standards Institution, 2, Park Street, W.1. Price 7s. 6d. (Postage extra to non-subscribers.)

From a paper to the London and Southern Section of the I.G.E., London, March 17.

Four River Crossing Projects Using Steel Mains

By F. BELL, B.Sc., M.Inst.Gas E.,

DISTRIBUTION ENGINEER,
THE SOUTHERN GAS BOARD.

THIS paper deals with four projects, all steel mains; the first, an 18-in. main through the Mersey Tunnel, the second, a 16-in. under the River Test near Southampton, the third, twin 8-in. mains across the Medina on the Isle of Wight and the fourth, twin 12-in. mains attached to the bridge structure over the Thames at Reading.

Although considerable general publicity was given to laying the Mersey Tunnel main, some of the design details which have never been published should be of some considerable interest.

The project was to lay an 18-in. main from the Grafton Street holder station of the Liverpool Group of the North Western Gas Board, to the Birkenhead works of the Wirral Group. The most satisfactory way of crossing the River Mersey was through the Mersey Tunnel and negotiations were opened with the Mersey Tunnel Joint Committee for permission to lay this main in the lower section of the tunnel from the George's Dock ventilation shaft on the Liverpool side to the Sidney Street shaft on the Birkenhead side (Fig. 1). In putting a scheme before the Tunnel Committee it must clearly be such as to leave no doubt as to the soundness of the pipe-line.

Difficult Route

The working pressure would probably never be more than 20 p.s.i. and initially something below 5 p.s.i.; nevertheless a pipe of $\frac{3}{8}$ in. wall thickness was chosen. All the joints were to be welded and every portion of every weld was to be inspected by radiographic means.

The initial survey of the tunnel revealed that a route was possible but difficult; the design of the pipe-line and the laying operations would have to be related to unusual conditions and in particular, to restricted entries. The pipe was to be some 6,600 ft. in length and of $18\frac{3}{4}$ in. o.d. but the only possible entry for pipes, and all other material and plant required for the operation, was through one manhole 4 ft. by 3 ft. Even the approach to this manhole was difficult. Material had first to pass through a normal size doorway from the main traffic tunnel, be lifted vertically into a space in the centre of a spiral staircase, dropped through the manhole and then manipulated through various small rooms and passages before finally entering the lower half of the tunnel and passing through 3-ft. square holes cut in various bulkheads and walls in the lower tunnel.

To determine the most suitable length for the pipes a dummy pipe was constructed in sheet metal with detachable sections and this was carried along the proposed route. It was shortened as obstructions presented themselves and gave a practical assurance that the length of the pipes must not exceed 18 ft.

Since the doorway and manhole entry into the lower tunnel was approximately two-thirds of the total distance from Liverpool to Birkenhead, arrangements had to be made for carrying the pipe backwards or forwards along the lower tunnel from that point. Electricity for welding could only be made available from mains supply at or near both ends of the route so that most of the power for welding would therefore have to be supplied from diesel operated generators.

Most of the material, both plant and pipes, had to be unloaded from lorries in the main tunnel, so this work had to be restricted to between midnight and 6 a.m., though a small number of pipes for the vertical ventilation shafts at Liverpool and Birkenhead were lowered through the shafts from the fan chambers. Even so, this work too had to be restricted to times during the night when ventilation fans could be put out of action. Apart from the twists and turns in the proposed route we had to contend with a curvature along the main tunnel—in several places of the order of 500-ft. radius.

All bends were to be factory made, solid drawn and of $\frac{1}{2}$-in. wall thickness with ends matched to the pipe diameter, so very careful measurements had to be taken by means of extending wooden jigs and by calculation from drawings supplied by the tunnel authorities.

There are three main gradients in the tunnel, one of 1 in 30 to its lowest point and then a rise of 1 in 300 followed by another of 1 in 30, so a syphon therefore

The pipe-line through the Mersey Tunnel, laid in the invert section between the Sidney Street, Birkenhead, ventilating shaft and Morpeth, where it can be seen entering the bulkhead.

was necessary. This was designed in the form of a blister using a piece of 24-in. steel main with eccentric tapers on each side to match the pipe.

During the survey evidence of considerable electrolytic corrosion was noted on other plant and it was decided that the whole of the new pipe-line should be insulated from the tunnel. Insulated blocks would, therefore, have to be designed to fit between the support and the pipe, and at every bearing point on wall brackets, at points where the pipe passed through bulkheads or walls and on the concrete supports along the floor of the tunnel. The material chosen for these insulated blocks was Texolex as used for a similar purpose in the Tyne Tunnel. The technical data of this material which is of a viscose fibre is as follows: Tensile strength 10,500 p.s.i., compressive strength 37,000 p.s.i., insulation resistance 8 megohms.

The pipe was internally protected by means of red lead paint to British Standard B.S.S. 2523:1954, with each pipe so painted to within 6 ft. of the end, the unpainted portions to be completed after welding.

The welding had to be of a very high standard so a firm of consultants who were welding specialists were employed and with their co-operation a specification was drawn up to meet the approval of the tunnel authorities and the tunnel consultants. The specification was even more exacting than A.P.I. 1104 which, with slight modifications, is used extensively for our pipe-line work.

The joints were butt welded with the ends of the pipe bevelled to 37½° and a root face of $\frac{1}{16}$ in. There were three runs for each weld; the first with $\frac{3}{32}$-in. rod, the second with the $\frac{5}{32}$-in. and the third with a $\frac{3}{16}$-in. rod. Each welder was subjected to a procedure and qualification test. Slag inclusion, porosity and other foreign bodies in any weld had not to exceed $\frac{1}{16}$ in. and not more than four such inclusions were permissible in each inch of weld. Any cracks or zones of incomplete fusion or lack of root penetration were rejected. Every weld was submitted to radiographic inspection throughout the whole of its length and records of this work were kept for inspection by the tunnel consultants and ourselves.

Most of the radiographic inspection was by single wall technique using a radioactive source of iridium 192. Five cassettes carrying Kodak 'Industrex D' films were required for each joint with the isotope centralised by means of a 'spider' pushed along the main with rods checked off to an exact measurement from the end of the pipe.

Maximum Movements

Calculations had shown that the maximum expansion to be expected in this pipe-line would be in the order of 10 in. but because of the number of short bends and the large lateral radius bends, it was decided that the expansion would be taken up by a sideways movement of the main. Some expansion would be absorbed by the use of greased bedplates welded to the main at the base of the vertical rising sections at each end of the tunnel and at two other places where the change of direction was roughly 90°C. Observations of expansion were made throughout 1957 and 1958 at the two ends of the tunnel. The maximum movement at the George's Dock end was 5/10 in. and 4/10 in. in 1957 and 1958 respectively and at the Sidney Street end the maximum movements were 7/10in. in each year.

Access holes had first to be constructed through the bulkheads and walls of the tunnel; this work was undertaken by a contractor who had worked on the tunnel previously. These holes were 3 ft. square, and to maintain the strength of the structure, they were suitably framed with channel iron sections. When deliveries of pipes started it was found that 11 pipes could be handled

each night from the main traffic tunnel down to the lower tunnel where they were stored on a special gantry for distribution during the day by a mobile petrol truck and bogey. In all 344 pipes each weighing about 12 cwt., 47 bends between 6 and 12 ft. long, 350 precast concrete packings, three diesel engined welding generators, two 400-volt welding generators, and the petrol truck and bogey were delivered through the openings described together with all incidental tackle for lifting and packing. All the generators and similar large plant, together with a sectional combined dark room and foreman's office complete with water and electrical connections had to be dismantled and reassembled on site in the lower tunnel.

Continuity Problem

The interior painting of the pipe joints presented a problem so far as continuity of work was concerned, and although several methods (including spraying) were examined, the best results were achieved by a man entering a pipe on a specially constructed wheeled bogey with a portable light. He not only painted these unpainted sections of pipe but descaled the inside of the joint with a scraper and wire brush. It was found to be an advantage to weld four lengths of pipe together and then offer the 72 ft. section on to the existing run. This length was limited by the distance the man could crawl or be pushed into the pipe for painting. It did mean, however, that three joints could be made as rolled welds for every one positional weld. Only two or three pipes could be treated in this way for use in the vertical sections and most of these welds in the rising air shafts were of the positional type.

The supports for the vertical rising pipes were made from 9-in. by 3½-in. R.S. channels, which in turn supported duck foot attachments welded to the underside of the steel bends. Wall brackets supporting the vertical pipes were all fitted with adjustable plates and Texolex packings so as to give even distribution of weight. Provision had to be made for maintenance so climbing rails were welded to the main in certain parts, care being taken to see that they were clear of the tunnel walls. Other aids to inspection were made by fitting permanent pulleys for bosun chair attachments and platforms secured to the air shaft walls.

Where the main passed through partitions or bulkheads an external sleeve was constructed, and the main was carefully insulated by means of pre-shaped Texolex packings, allowance for movement being made by the use of rubber seals. In all some 360 Texolex segments of various designs were used.

The construction of the pipe-line started at the Liverpool end of the lower tunnel; the vertical pipe was placed in position during night periods only and the lower tunnel sections during the day. Two cast steel valves, one fitted at each end of the pipe-line at the upper tunnel level near the fan chamber entry points, are operated by electric motors and mounted on staging constructed of crossed braced 6-in. by 3-in. channels. A cubicle houses all electrical equipment; the valves can be operated locally or by remote control from the Gas Board's Liverpool control room, by means of a telephone line between it and each of the two valve positions. A direct telephone line also connects the control rooms of the Gas Board and the tunnel authorities. Since the valve sites are in the fresh air fan chambers and subjected to weather conditions, all equipment is weather-proofed and the cubicles heated by a thermostatically controlled heater.

On each side of the valve is a complete insulating flange between the main coming in from outside ground conditions and the tunnel main proper thus making for total insulation of the tunnel steel main.

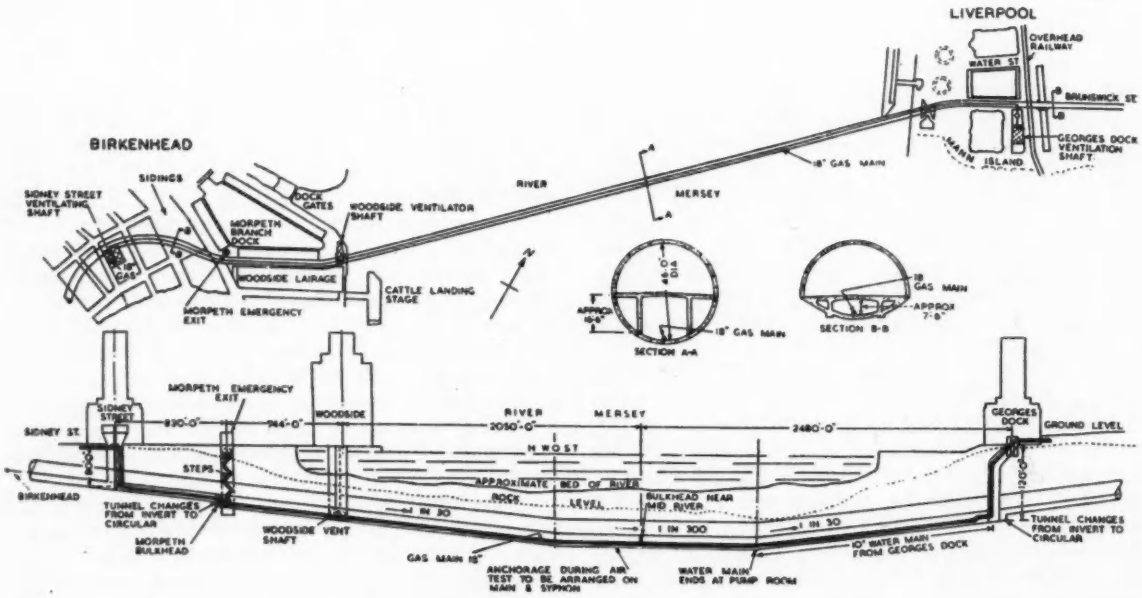


Fig. 1. The layout of the Mersey Tunnel showing the route of the main. The shape of the two sections gives some idea of the difficulties involved in getting the pipes into position.

Up to 35 joints were made each week which on our pipe-lining experience seems fearfully slow. The confined space of the tunnel made it necessary to mount red lights on either side of the isotope as a warning when radiographic exposures were in progress. If, however, it was essential for anyone to work particularly close to the joint on test, a specially constructed mobile lead shield was used. This had two handles at one end and a wheel at the other end to allow it to run along the main on the principle of a wheelbarrow.

As the pipe-line progressed and the main was tested and approved, all plant and tackle had to be withdrawn because no more material could be passed through the holes in the partitions or bulkheads when the pipe was in position.

When the pipe-line was completed it was subjected to a hydraulic test of 184 p.s.i. followed by an air leakage test at 30 p.s.i. During both these tests very careful outside examination of all joints was made, but at no time was the slightest indication of leakage revealed.

The whole of the external surface of the pipe-line throughout the tunnel was protected by an application of two coats of asbestos-based bituminised paint, and the various holes in the tunnel structures were sealed with concrete after new reinforcement had been arranged around the pipe sleeves and welded to the existing reinforcement.

Thrust Boring

The 16-in. high pressure steel backbone main from Southampton towards Poole had to cross the River Test and since this main had to carry the supply to Salisbury the crossing point of the river had to be somewhere near Nursling, north of Southampton Water. This particular stretch of the river offers some of the most exclusive fishing in this country.

There were three methods by which this river could be crossed; by a self-supporting span, by drag lining a trench through the bed of the river or by a thrust bore below the bed of the river.

Preliminary investigations indicated that there would be serious objections to the main being erected above the river since the amenities of the Test Valley could not be spoiled in this way.

The suggestion to lay the main in the bed of the river by drag lining was not acceptable to the owner of the land. The River Board, responsible to the Fishing Authority for fish, food and spawning grounds, would not allow the river bed to be excavated because it disturbed the spawning grounds at the point of crossing and for some distance below the crossing.

The third method of thrust boring beneath the river was acceptable to all parties provided work did not start until after the fishing season at the end of September.

The river is 64 ft. wide between banks and these are

Top, right: *A section of the main where it first enters the lower main tunnel at the Liverpool end. The insulation between the blocks and the pipe can be seen.*

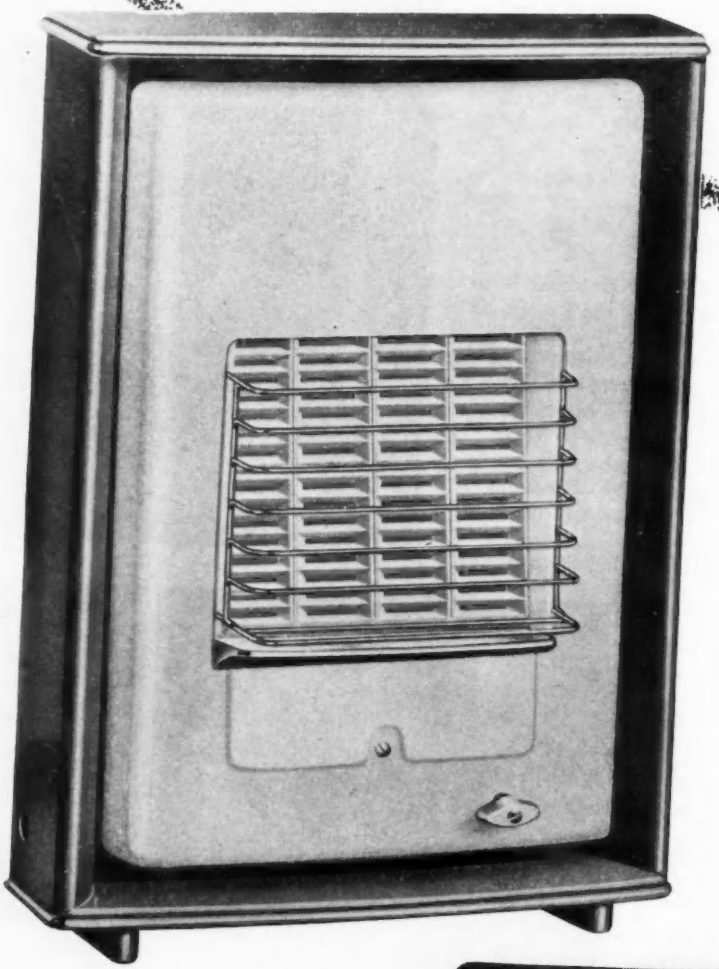
Below, right: *In George's Dock air shaft. A view from the platform at the top of the air shaft showing the completed main coming up the shaft and across the throat of the breechespiece. Climbing stirrups are seen fitted for maintenance and inspection.*

It's a

NEW

—NOW

of two-



NEW WORLD

PRODUCT OF Radiation Ltd

leads

only a few inches higher than normal water level. The surrounding land is marshy and, as we found during the operation, consisted of 5 ft. of peat resting on gravel. The river is 3 ft. 6 in. deep and to leave the river bed undisturbed the main was laid 10 ft. below the surface of the surrounding land. Eventually a working pit 50 ft. long, 13 ft. deep and 10 ft. wide was needed. Excavations for this pit were started by using a grab but it was soon found that piling was necessary. Thin sheet steel piling, ¼ in. thick and 10 ft. long, was first employed but immediately the excavation got down to gravel level the pile-up of water and the pressure on the sheet piling was so severe that this was abandoned in favour of heavy ⅜ in. thick steel interlocking sheet piling some 28 ft. long to form a caisson. Even this when completed required a number of high duty pumps to remove the water forced up through the gravel bed of the pit.

Rails to take the auger type boring machine were fitted at the correct level on a prepared bed at the bottom of the excavation and the machine lowered into position.

With the first section of liner and its cutting head and auger in position, a hole was cut in the sheet piling just large enough to take the liner. As soon as the disc fell out of position in the sheet piling a large volume of water entered the pit and at one time caused such a subsidence that it threatened to undermine the river bank adjacent to the caisson. With the liner in position the space between it and the sheet piling was caulked to reduce the amount of water entering the pit although during the boring operation a considerable amount of water, together with the excavated material, did come through the liner into the pit. Weather conditions throughout the whole operation were not helpful and heavy rain brought the river to the top of its banks and made working conditions difficult and unpleasant.

So that the hole excavated on the remote side of the river should be as far away as reasonable, the set of the liner was given an upward angle and the thrust bore was extended well beyond the width of the river. A sleeve 123 ft. long was inserted and subsequently an excavation was made at this point on the opposite side of the river to the caisson. Here also there was peat and the ground was waterlogged, so shuttering was again necessary.

Condensate Dip Pipe

When the liner was ready, a bull-nosed end with a ring was welded on to the first length of the 16 in. pipe which was passed through the sleeve. Further lengths of 16-in. pipe were welded on to this and after joints had been tested and protected with bitumen and glass scrim, and the whole pipe covered with oak laths to protect the wrapping, it was projected through the liner into the excavation on the far side of the river. It was impossible to keep the excavation on the receiving end clear of water and so further lengths were threaded through from the caisson side into a newly cut trench until the bull-nose of the 16-in. pipe could be raised clear of the water and the length under the river bed tied into the remaining pipe-line.

The end of the pipe in the caisson was the lowest point in the system and on to this were fitted two 45° bends to bring the pipe up to our standard laying depth of 2 ft. 6 in. below ground level. Although dry gas is to be distributed through this main, the precaution was taken of fitting a condensate dip pipe down through the 45° bends to the lowest point. To guard against the steel liner becoming anodic from the cathodic protection applied to the 16-in. main, provision was made to bond the sleeve to the pipe-line. In welding up the steel liner, care was taken that it would be completely water tight and the space between the pipe and the liner at each end was caulked as a further precaution.

Finally when dismantling the caisson the two sections of shuttering in the line of the pipe were cut at a suitable distance below the bottom of the pipe and brackets welded on to them to act as a support to the pipe-line at this point. The remainder of the shuttering, with the exception of the sheets nearest to the river bank, was removed as the hole was being filled in.

Supply to West Cowes

When it was decided to build a new works at Kingston, East Cowes, on the Isle of Wight an integration system was also planned for the whole Island in order to close the existing six works. The integration system was designed for pressures of between 5 and 10 p.s.i. and the mainlaying was of traditional type using spun iron pipes with flexible joints.

The supply to West Cowes presented a special problem. It could be taken either by an extension of the cast iron integration system from Newport along the west side of the river to West Cowes or, alternatively, by crossing the River Medina from East to West Cowes. It was decided to take the much shorter route across the river.

The Medina is navigable for small craft between Cowes and Newport, a distance of some five miles. There are no bridges crossing the river and its width at Cowes at high water varies between 800 and 1,000 ft. with a depth of 18 ft. to 20 ft.

River traffic is fairly heavy and could only be re-

A section of the twin mains crossing the River Medina in the Isle of Wight, lashed to empty steel drums, ready to be floated out at high tide.

stricted by arrangement and this was limited to four hours; the time we eventually chose was three hours before and one hour after high tide.

Gas flows indicated that an 8-in. main would be necessary for the supply to the west side of the river but as the major portion of the costs was for preparation, dredging, backfilling and hire of plant it was decided to lay two mains at the same time. The point chosen for the crossing was about one mile up from the river mouth where there is a small promontory of hard standing which could be used to help construction work.

The material chosen for the pipe-line was mild steel tube, seamless and equivalent quality to A.P.I.5L Grade B, 8⅝ in. o.d., ⅞ in. thick and in random lengths of 35 ft. to 40 ft. The pipes were bevelled for welding, descaled, phosphate treated, painted internally with red lead paint and protected externally with seamless bitumen sheathing reinforced with fibre-glass.

The welding was in accordance with B.S.S. 2633 Class 1 and every joint was radiographed. Ultrasonic testing was in its infancy though some experimental work with this method of testing was in fact done on this pipe-line. All the joints after testing were protected with two coats of bitumen and glass fibre and as an additional precaution each received a further coating of P.V.C. tape.

Since no provision had then been made to dry the gas leaving the Kingston works means had to be provided for removing the condensate from the lowest point in the river crossing. Blister type syphons were, therefore, designed, made up from 15-in. diameter sections with tapers on each side. The suction pipes were of seamless steel tube with seamless hydraulic sockets screwed to taper and protected internally and externally with red lead paint.

Small chrome steel wheel carriages were designed to fix to the suction lines so that they could be easily run into the pipe-lines after the completion of the job.

Levelling Bank

Site preparation started in mid-December, 1956, with the levelling of the east side of the river bank to form a platform on which the pipe-lines could be fabricated. The pipe-lines each 800 ft. in length, were assembled and welded up along the river side supported on timber baulks; the two mains being fixed at 3 ft. 6-in. centres.

To provide additional protection for the pipe wrapping, particularly during the launching and sinking operations, the completed mains were encased in oak laths 3 ft. long by ¾ in. by ½ in. fixed with wire straps. Finally steel bridles were attached to the twin mains in preparation for their lifting, moving and lowering.

While the pipe welding was in progress the trench in the river was excavated by a chain bucket dredger; drag line machines were used to excavate the banks and the near approaches to the banks which the dredger could not reach. In the centre of the river there was some 10 ft. of silt and dredging was continued below this silt in order to provide approximately 2 ft. of cover for the pipes in solid ground. The dredged material was loaded into barges and dumped at sea. The trench was excavated to about 6 in. below the proposed pipeline invert so that a gravel base could be prepared for the main. A barge with a grab on board was used to place the gravel at intervals of 35 ft. across the bottom of the trench to form bearers and with the help of divers these were levelled. After the pipeline had been laid gravel filling was continued to above the top of the pipe and then larger gravel up to 1½ in. size brought the cover to 12 in. above the main.

Sixteen 'Jubilee' tracks were laid from above high water level down to the river to normal low water level, a distance of about 80 ft. Bogeys were fitted on to the tracks and the pipe-lines lifted from the timber supports on to the bogeys. The river ends of the tracks were in such a position that the pipes could be picked up by pontoons from the bogeys on the rising tide. Drums to act as floats were strapped to the main to ensure that the whole pipe-line would float from the bogeys when launching took place. The launching was carried out at high water, land retaining ropes were cut, and the twin mains moved on the bogeys quickly and evenly into the water. Immediately the mains had floated they were towed into a position still parallel with the bank by five pontoons and they were allowed to fall with the ebbing tide and settle on the mud at a position clear of low water line. All the movements were controlled by wire hawsers connected to land anchors or pontoons.

A number of the floats were then removed from the pipe-lines to ensure that they would rest on the mud throughout the subsequent rise and fall of the sea until the final pipe-laying and sinking operations were carried out.

Ready for High Water

Pipe-laying operations started at 8 a.m. in good weather on the morning of February 16, 1957. The operation of towing the twin mains across the river and sinking them was carefully planned so that the pipe-lines were in position for lowering at high water when there would be the minimum of tidal movement. The pontoons in the river were attached to the bridles on the pipe-lines by wire hawsers and the pontoons floated into position over them as the rising tide allowed.

At 10.30 a.m. the towing lines from the pontoons were carried by motor launch to two winches on a dredger situated on the north of the trench and to a launch moored to the south of the trench. The ends of the pipe were connected in a similar manner to winches on each side of the river. With hawsers in position and the pipes now floating beneath the pontoons the movement into position began. This was carried out by pulling on the various winches and the whole operation being directed by one engineer from a river launch. The pontoons were in the correct position across the river at 1 p.m. and the lowering started immediately. The operation took 30 minutes.

Final Inspection

The location of the mains and syphons was checked in accordance with set land marks and by echo sounding apparatus. At low water measurement of the position of the pipe was made by means of staff and line and a final inspection made by divers.

The air testing of the mains at 30 p.s.i. (a pressure at least double the maximum working pressure) was made at three separate stages in the construction work; the first when the pipe-lines were welded up on the river

bank, the second after the pipes had been laid in the river bed and back-filled to a cover of 6 in. and finally at the completion of the whole work. All the tests were entirely satisfactory.

The protective coating of the pipes was checked by holiday apparatus at various stages up to fitting the oak laths. The steel pipes were electrically insulated from the cast iron integration mains so that cathodic protection could be applied to the river crossing. Cathodic protection was achieved in this case by the use of four 17-lb. magnesium anodes, two on each side of the river.

The route of the 18-in. diameter high pressure steel main, also part of the integration system of the Board, between Reading and Oxford crosses the River Thames at the Reading Bridge. This bridge is a reinforced concrete structure built in 1923 and has a single span of 181 ft. 6 in. with arched abutments either side. Four main arched beams springing from just above the water level rise to give 18 ft. head room at the centre of the span. The deck is a reinforced concrete slab 7½ in. thick on 35 14-in. by 7-in. crossbeams supported by and spanning between the main arches.

The footwalks of the bridge have shallow ducts for service mains, but since they are already occupied and there is no depth for mains in the carriage-way permission was sought to suspend the main from the underside of the bridge. The proposal was not received favourably by the planning authority since a main of 18 in. diameter would show beneath the soffits of the main arches and detract from the appearance of the curve of the arches. The largest diameter main which could be put across without showing below the arches was 12 in. and accordingly an alternative scheme involving the use of two 12-in. mains for the crossing was proposed and accepted.

A view of the twin 12-in. mains running under the Reading Bridge over the River Thames.

Welds Conform to Standard

Both the 18-in. and the 12-in. diameter pipes have a wall thickness of $\frac{5}{16}$ in. and all welds were made to conform to A.P.I. Standard 1104 with some adjustments to the standards of acceptability. Every weld on the bridge including those made on the prefabricated specials was radiographed.

An 18-in. diameter steel header pipe with a 12-in. branch and reducing to a 12-in. bend was laid in the river bed alongside the face of each abutment. Twin 12-in. diameter risers pass up the face of each abutment between the springings of the two central main arches and open bends join them to two 12-in. diameter steel mains suspended from the reinforced concrete deck beams of the bridge. There is a rise of 1 in 35 in the eastern approach to the bridge and 1 in 30 in the western approach and a 176½° bend was therefore placed at the centre of each suspended main. The 18-in. diameter header pipes are connected to approach mains passing through the river banks well clear of the bridge abutment foundations.

Access to the underside of the bridge was difficult and, since all pipes had to be threaded between concrete members, it was considered best to lift the pipes from the towpath or bank and pass them along the deck to their correct positions. For this purpose a pair of steel cables was fixed beneath the bridge from steel beams lashed to the main arches at each side of the river. The cables were kept taught so that a specially constructed bogey could travel along them.

The deck beams of the bridge had been specially reinforced and it was made clear to us that in drilling the holes for the sleeves and bolts we must not damage the reinforcement. To overcome this we took a radiograph at each point where a drilling was required. This enabled us to drill our 1½-in. diameter holes to take the sleeves and attachment bolts.

Overcoming Restricted Headroom

Stirrups of 3-in. by ¾-in. flat steel galvanised after shaping were bolted to the beams and 1-in. thick lugs were welded at measured spacings to the pipes. To lift each pipe from the travelling cradle, yokes of ½-in. plate were temporarily bolted to the concrete beams and deep stools placed beneath each pipe. The distance from the top of the yoke to the base of the stool allowed the use of pull lifts on each side of the pipe despite the restricted headroom.

Cutting lengths were allowed for at each end of the suspended mains and also in the four riser mains so that the bends at mid span could be erected first and pipes added on each side towards the abutments.

At the towpath side of the river the water is only a few inches deep and this was kept from the work by a stack of earth bags. A trench was cut along the face of the abutment and the 18-in. header pipe with its 12-in.

bend set in its exact position. The risers, top bends and cutting pipes were then measured off, cut and welded into place. Very accurate measurements were necessary for the cutting lengths as the permissible welding gap at the butt welds was 1/32-in. to 1/8-in.

On the north side of the river the water is 4 ft. deep at the bridge abutment and the river bed falls sharply from the bank. A sheet pile caisson was constructed 7 ft. from the abutment face and returned at the ends of the river bank clear of the bridge. Owing to the lack of headroom beneath the bridge arches short piles had to be driven to water level and extended by welding on to each section a succession of 2-ft. lengths until the required depth of 14 ft. 6 in. was obtained. The water was pumped from the caisson, the river bed excavated and a concrete base slab laid below the bottom of the pipe.

Extra Buoyancy

In this case the header pipe, riser and top bends were welded together on the bank, the joints radiographed and wrapped and stoppers fixed in the open end. The whole assembly was lifted into the river to be floated below the bridge but as a precaution sealed steel drums were lashed to the pipes to provide buoyancy. A cable and pulley system was rigged on the bridge members and the pipes lifted from the water by a tractor working on the bank.

After positioning the final cutting lengths were prepared and welded to complete the pipe work under the bridge. Links with the main laid up to the river bank were then made and the whole pipe work below water level protected with bitumen enamel reinforced with fibreglass.

No Obstruction

A second wall of sheet piling was driven within the caisson 3 ft. from the face of the abutment and down to river bed level. The trench thus formed round the pipe was filled with concrete and a concrete pier built up around the risers clear of the highest recorded flood level. The trench on the towpath side was also filled with concrete under and around the pipe. There is now no danger of scour undercutting the protective concrete around the main and there is no obstruction in the bottom of the river to the navigation of boats to popular moorings near this bridge.

No special provision for expansion was made as in this position variation in temperatures of the main will be low and with the under water pipes firmly bedded in concrete the crossing forms a simple expansion bend sufficiently flexible to prevent excessive stress in the steel from temperature or loading variations. Finally the main was tested with air at 150 p.s.i. and the exposed sections of main were painted light grey to match the concrete.

J. BROWN & CO. LTD.
SAVILE TOWN, DEWSBURY, YORKS.
Supply:-
"BROWNOX-de-LUXE" PURIFYING MATERIAL
Purchase:-
SPENT OXIDE

COMPRESSORS & EXHAUSTERS FOR AIR AND GAS.
See our Advertisement Next Week.
REAVELL & CO., LTD. IPSWICH.

skilled hands—or stilled hands?

Every year thousands of skilled hands are stilled for weeks, even months, by dermatitis. It's all so unnecessary. *Hands can be protected* by Rozalex Barrier Creams. There are 12 of them to provide protection against almost all known industrial irritants. Details of the creams and full technical resources are available from Rozalex Ltd., 10 Norfolk Street, Manchester, 2.
ROZALEX BARRIER CREAMS protect
R123F

CONTRACTORS TO H.M. GOVERNMENT DEPARTMENTS

RAIL-TRACK MAINTENANCE LTD
REGISTERED OFFICE
42 HYDE ROAD · DENTON
MANCHESTER
Telephone: DEN. 3482
COMPLETE TRACK SERVICE ...
... SURVEY, DESIGN, SUPPLY and INSTALLATION